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Stennis Space Center, MS 39529-5004



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Report Detailing Modifications to the 1/8° Global Bathymetry

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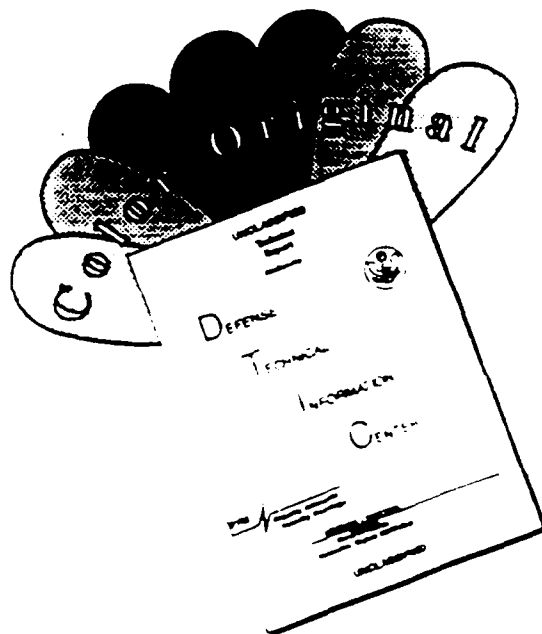
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Report Detailing Modifications to the 1/8° Global Bathymetry

Introduction

This report details the changes made to the 1/8° global topography used in the Navy Layered Ocean Model using GEBCO (General Bathymetric Chart of the Oceans) as a reference. Changes were made to the following regions:

PACIFIC OCEAN

- Aleutian Islands
- Hawaiian Islands (including the shoals and islands to the west)
- Channel Islands west of Los Angeles
- Galapagos Islands
- Tahiti and the Marquesas
- Line Islands
- Samoa Islands
- New Hebride Islands
- Fiji Islands (including Northern New Caledonia)
- TOGA/COARE region (especially the Gilbert Islands)
- Indonesian throughflow region
- Philippine Islands
- South China Sea
- East China Sea
- Izu Ridge (including the Mariana Islands)
- Tsushima Strait
- Sea of Japan
- Soya Strait

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- Kuril Islands

ATLANTIC OCEAN

- GIN Sea region
- Azores
- Canary Islands
- Cape Verde Islands
- Barbados
- Lesser Antilles
- West Indies
- Bahama Islands
- Bermuda

INDIAN OCEAN

- Maldive Islands
- Andaman Islands
- Selat Mentawai
- Indonesian throughflow region
- Chagos Laccadive Ridge and Diego Garcia Island
- Mascarene Plateau
- Shoals and Islands to the north and west of Madagascar Island
- Seychelle Islands

MEDITERRANEAN SEA

- Balearic Islands
- Sicilian Channel

The new global topography has been named top117a. This topography incorporates the 1/8° N Atlantic (na632k) and 1/8° N Pacific (p133d) topographies. The 1/8° global topography, which preceded top117a, was named top08_200g_global. The modifications made to generate the new topography include the addition of missing islands and shoals, the removal of nonexistent islands, the shifting of islands and shoals to undersea ridges, the conversion between model land/plot sea points and land points, and the modification of straits.

The Pacific Ocean (Figure 1) required the most changes. Some of the regions, such as the Aleutian Islands, required little change. Most, however, required major revision particularly the Hawaiian Islands, the TOGA/COARE region, the Kuril Islands and the Indonesian throughflow region.

Soya and Tsushima Straits were modified to provide a more realistic geometry that more closely resembled the actual straits. This required setting depths that were less than 200 m in the ETOPO5 topography to 201 m in the p133d topography. A separate file was then generated for each strait that contains the depth for that gridpoint from the ETOPO5 bathymetry. These two files can then be used as inputs to the model to generate friction values to dampen the flow through these straits.

Plots are included that show the N Pacific (Figure 2), N Atlantic (Figure 3), ETOPO5 bathymetry, the unmodified global bathymetry, the modified global bathymetry, and the twice-smoothed modified global bathymetry (Figures 1-100). Also included are the sill depths (Tables 1-4) for the ETOPO5, modified global, and twice-smoothed modified global bathymetries for selected straits of interest. Plots are also included that show the locations of the sill depths (Figures 101-115).

The changes to the Atlantic Ocean (Figure 4) were concentrated in the West Indies and the Lesser Antilles. Most of the changes in the West Indies were in the small islands and shoals to the north of Cuba and Hispanola. Extensive changes were made to the Lesser Antilles along with sill depths being modified to be in closer agreement with the ETOPO5 depths. Also, Bermuda and Barbados Islands were added to the topography.

The Azores, Canary, and Cape Verde Islands of the eastern Atlantic Ocean required the addition and shifting of many islands in the groups.

Changes in the Indian Ocean were made mostly to the Maldive Islands, the shoals to the south of the equator in the central and western Indian Ocean, and the islands and shoals in the eastern Indian Ocean along the Andaman Sea and the Selat Mentawai region.

Minor changes were made to other regions of the world. These were concentrated in the Drake Passage/Falkland Islands region, New Zealand, the Loyalty Islands and the Mediterranean Sea. Some smoothing and removal of small bays in Antarctica and peninsulas was also performed.

Acknowledgments

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Table 1: Comparison of sill depths for the p133d, p133d smoothed and ETOPO5 topographies for the N Pacific Ocean.

| | p133d | p133d smoothed | ETOPO5 |
|--------------------|-----------|----------------|-----------|
| Strait | Depth (m) | Depth (m) | Depth (m) |
| Aleutian Islands 1 | 2056 | 2260 | 2072 |
| Aleutian Islands 2 | 1413 | 1512 | NA |
| Aleutian Islands 3 | 959 | 996 | 797 |
| Aleutian Islands 4 | 747 | 812 | NA |
| Aleutian Islands 5 | 752 | 892 | 921 |
| Aleutian Islands 6 | 1029 | 1201 | 1018 |
| Aleutian Islands 7 | 398 | 461 | 414 |
| Vitiaz Strait | 925 | 710 | 741 |
| SW Pacific Ocean 1 | 276 | 288 | 286 |
| SW Pacific Ocean 2 | 254 | 304 | 272 |
| SW Pacific Ocean 3 | 397 | 373 | 444 |
| SW Pacific Ocean 4 | 481 | 500 | 490 |
| SW Pacific Ocean 5 | 1806 | 1816 | 1768 |
| SW Pacific Ocean 6 | 534 | 631 | 524 |
| East China Sea 1 | 787 | 838 | 785 |
| East China Sea 2 | 414 | 486 | NA |
| East China Sea 3 | 243 | 277 | 245 |
| East China Sea 4 | 201 | 268 | 242 |
| East China Sea 5 | 393 | 390 | 344 |
| East China Sea 6 | 1043 | 986 | 1040 |
| East China Sea 7 | 366 | 652 | 806 |
| East China Sea 8 | 684 | 649 | NA |
| East China Sea 9 | 314 | 419 | 265 |
| East China Sea 10 | 551 | 548 | 513 |
| Izu Ridge 1 | 412 | 441 | 401 |
| Izu Ridge 2 | 212 | 274 | NA |
| Izu Ridge 3 | 253 | 269 | NA |
| Izu Ridge 4 | 891 | 865 | NA |
| Izu Ridge 5 | 477 | 502 | NA |
| Kuril Islands 1 | 201 | 200 | NA |
| Kuril Islands 2 | 469 | 517 | 478 |
| Kuril Islands 3 | 2066 | 2359 | 2000 |
| Kuril Islands 4 | 400 | 601 | 540 |
| Kuril Islands 5 | 810 | 1068 | NA |
| Kuril Islands 6 | 887 | 1195 | NA |
| Kuril Islands 7 | 1035 | 1241 | NA |
| Kuril Islands 8 | 220 | 253 | 266 |

Table 2: Comparison of sill depths for the na632k, na632k smoothed and ETOPO5 topographies for the N Atlantic Ocean.

| | na632k | na632k smoothed | ETOPO5 |
|------------------------------|-----------|-----------------|-----------|
| Strait | Depth (m) | Depth (m) | Depth (m) |
| Anegada Passage | 1480 | 1360 | 1923 |
| St. Christopher Passage | 390 | 424 | 409 |
| Guadeloupe Passage | 550 | 625 | 495 |
| Dominica Channel | 552 | 573 | 464 |
| Martinique Channel | 807 | 880 | 900 |
| St. Lucia Channel | 924 | 936 | 855 |
| St. Vincent Channel | 642 | 739 | 541 |
| Grenada Passage | 468 | 516 | 511 |
| Mona Passage | 507 | 542 | 545 |
| Windward Passage | 2134 | 2142 | 2134 |
| Old Bahama Passage | 273 | 279 | 293 |
| Florida Strait | 566 | 510 | 578 |
| Northwest Providence Channel | 530 | 488 | 546 |
| Crooked Island Passage | 1817 | 1636 | 1780 |
| Mayaguana Passage | 1558 | 1344 | NA |
| Caicos Passage | 1712 | 2201 | 2554 |
| Turks Islands Passage | 524 | 537 | NA |
| Mouchoir Passage | 579 | 770 | NA |
| Silver Bank Passage | 2719 | 2256 | 2737 |
| GIN Sea 1 | 547 | 402 | 594 |
| GIN Sea 2 | 690 | 837 | 936 |
| GIN Sea 3 | 300 | 296 | 289 |

Table 3: Comparison of sill depths for the $1/8^\circ$ world ocean model topography (wom08), wom08 smoothed and ETOPO5 topographies for the Mediterranean Sea, the Falkland Islands and New Zealand.

| | wom08 | wom08 smoothed | ETOPO5 |
|---------------------|-----------|----------------|-----------|
| Strait | Depth (m) | Depth (m) | Depth (m) |
| Strait of Gibraltar | 201 | 201 | NA |
| Mediterranean Sea 1 | 680 | 627 | 784 |
| Mediterranean Sea 2 | 322 | 355 | 388 |
| Mediterranean Sea 3 | 332 | 349 | 351 |
| Mediterranean Sea 4 | 615 | 734 | 992 |
| Mediterranean Sea 5 | 682 | 640 | 738 |
| Falkland Island | 393 | 398 | 399 |
| New Zealand | 508 | 521 | 496 |

Table 4: Comparison of sill depths for the $1/8^\circ$ world ocean model topography (w117a), w117a smoothed topography, ETOPO5 topography, $1/8^\circ$ world ocean model topography (w116e), and w116e smoothed topography for the Indian Ocean.

| | w117a | w117a | ETOPO5 | w116e | w116e |
|---------------------|-----------|-----------|-----------|-----------|-----------|
| | | smoothed | | | smoothed |
| Strait | Depth (m) | Depth (m) | Depth (m) | Depth (m) | Depth (m) |
| Socotra Island | 685 | 680 | 718 | 598 | 843 |
| Maldiv Islands 1 | 600 | 623 | 1923 | NA | NA |
| Maldiv Islands 2 | 510 | 426 | 409 | NA | NA |
| Maldiv Islands 3 | 230 | 232 | 495 | NA | NA |
| Maldiv Islands 4 | 353 | 555 | 464 | 225 | 668 |
| Maldiv Islands 5 | 1414 | 1403 | 900 | NA | NA |
| Maldiv Islands 6 | 1997 | 1857 | 1896 | 1990 | 1972 |
| Andaman Sea 1 | 377 | 484 | 399 | 635 | 759 |
| Andaman Sea 2 | 1110 | 1271 | NA | 1262 | 1191 |
| Andaman Sea 3 | 971 | 970 | 827 | 943 | 1099 |
| Andaman Sea 4 | 482 | 760 | 228 | NA | NA |
| Andaman Sea 5 | 236 | 521 | 207 | NA | NA |
| Andaman Sea 6 | 1737 | 1598 | 1408 | 1709 | 1610 |
| Andaman Sea 7 | 327 | 405 | 512 | 325 | 730 |
| Indo. throughflow 1 | 249 | 514 | 230 | 201 | 465 |
| Indo. throughflow 2 | 588 | 801 | 578 | 767 | 721 |
| Indo. throughflow 3 | 1063 | 1065 | 1045 | 1063 | 1236 |
| Indo. throughflow 4 | 1007 | 949 | 1020 | 1007 | 1099 |
| Indo. throughflow 5 | 1452 | 1291 | 1530 | 1458 | 1212 |
| SW Indian Ocean 1 | 480 | 619 | NA | NA | NA |
| SW Indian Ocean 2 | 483 | 846 | 309 | 576 | 890 |
| SW Indian Ocean 3 | 904 | 1264 | 903 | 1227 | 1191 |
| SW Indian Ocean 4 | 395 | 411 | NA | 450 | 699 |
| SW Indian Ocean 5 | 624 | 827 | 785 | 624 | 848 |
| SW Indian Ocean 6 | 640 | 807 | 1454 | 840 | 964 |

Figure Captions

Figure 1: Plot of the Pacific Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 2: Plot of the North Pacific Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 3: Plot of the North Atlantic Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 4: Plot of the Atlantic Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 5: Plot of the Aleutian Islands from the unmodified $1/8^\circ$ Pacific topography.

Figure 6: Plot of the Aleutian Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 7: Plot of the Aleutian Islands from the new $1/8^\circ$ Pacific topography.

Figure 8: Plot of the Aleutian Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 9: Plot of the Hawaiian Islands and the shoals to the northwest from the unmodified $1/8^\circ$ Pacific topography.

Figure 10: Plot of the Hawaiian Islands and the shoals to the northwest from the $1/12^\circ$ ETOPO5 topography.

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Figure 12: Plot of the Hawaiian Islands and the shoals to the northwest from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

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Figure 14: Plot of the Channel Islands west of Los Angeles, California from the $1/12^\circ$ ETOPO5 topography.

Figure 15: Plot of the Channel Islands west of Los Angeles, California from the new $1/8^\circ$ Pacific topography.

Figure 16: Plot of the Channel Islands west of Los Angeles, California from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 17: Plot of the Galapagos Islands from the unmodified $1/8^\circ$ Pacific topography.

Figure 18: Plot of the Galapagos Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 19: Plot of the Galapagos Islands from the new $1/8^\circ$ Pacific topography.

Figure 20: Plot of the Galapagos Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 21: Plot of the Line Islands from the unmodified $1/8^\circ$ Pacific topography.

Figure 22: Plot of the Line Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 23: Plot of the Line Islands from the new $1/8^\circ$ Pacific topography.

Figure 24: Plot of the Line Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 25: Plot of the Samoan Islands from the unmodified $1/8^\circ$ Pacific topography.

Figure 26: Plot of the Samoan Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 27: Plot of the Samoan Islands from the new $1/8^\circ$ Pacific topography.

Figure 28: Plot of the Samoan Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 29: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the unmodified $1/8^\circ$ Pacific topography.

Figure 30: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 31: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the new $1/8^\circ$ Pacific topography.

Figure 32: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 33: Plot of the TOGA/COARE region from the unmodified $1/8^\circ$ Pacific topography.

Figure 34: Plot of the TOGA/COARE region from the 1/12° ETOPO5 topography.

Figure 35: Plot of the TOGA/COARE region from the new 1/8° Pacific topography.

Figure 36: Plot of the TOGA/COARE region from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 37: Plot of the Indonesian Throughflow region from the unmodified 1/8° Pacific topography.

Figure 38: Plot of the Indonesian Throughflow region from the 1/12° ETOPO5 topography.

Figure 39: Plot of the Indonesian Throughflow region from the new 1/8° Pacific topography.

Figure 40: Plot of the Indonesian Throughflow region from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 41: Plot of the Philippine Islands and the S China Sea from the unmodified 1/8° Pacific topography.

Figure 42: Plot of the Philippine Islands and the S China Sea from the 1/12° ETOPO5 topography.

Figure 43: Plot of the Philippine Islands and the S China Sea from the new 1/8° Pacific topography.

Figure 44: Plot of the Philippine Islands and the S China Sea from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 45: Plot of the E China Sea from the unmodified 1/8° Pacific topography.

Figure 46: Plot of the E China Sea from the 1/12° ETOPO5 topography.

Figure 47: Plot of the E China Sea from the new 1/8° Pacific topography.

Figure 48: Plot of the E China Sea from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 49: Plot of the Mariana Islands from the unmodified 1/8° Pacific topography.

Figure 50: Plot of the Mariana Islands from the 1/12° ETOPO5 topography.

Figure 51: Plot of the Mariana Islands from the new 1/8° Pacific topography.

Figure 52: Plot of the Mariana Islands from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 53: Plot of the Izu Ridge from the unmodified $1/8^\circ$ Pacific topography.

Figure 54: Plot of the Izu Ridge from the $1/12^\circ$ ETOPO5 topography.

Figure 55: Plot of the Izu Ridge from the new $1/8^\circ$ Pacific topography.

Figure 56: Plot of the Izu Ridge from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 57: Plot of the Sea of Japan from the unmodified $1/8^\circ$ Pacific topography.

Figure 58: Plot of the Sea of Japan from the $1/12^\circ$ ETOPO5 topography.

Figure 59: Plot of the Sea of Japan from the new $1/8^\circ$ Pacific topography.

Figure 60: Plot of the Sea of Japan from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 61: Plot of the Sea of Okhotsk from the unmodified $1/8^\circ$ Pacific topography.

Figure 62: Plot of the Sea of Okhotsk from the $1/12^\circ$ ETOPO5 topography.

Figure 63: Plot of the Sea of Okhotsk from the new $1/8^\circ$ Pacific topography.

Figure 64: Plot of the Sea of Okhotsk from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

Figure 65: Plot of the GIN Sea from the unmodified $1/8^\circ$ global topography.

Figure 66: Plot of the GIN Sea from the $1/12^\circ$ ETOPO5 topography.

Figure 67: Plot of the GIN Sea from the new $1/8^\circ$ Atlantic topography.

Figure 68: Plot of the GIN Sea from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

Figure 69: Plot of the Canary and Azore Islands from the unmodified $1/8^\circ$ global topography.

Figure 70: Plot of the Canary and Azore Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 71: Plot of the Canary and Azore Islands from the new $1/8^\circ$ Atlantic topography.

Figure 72: Plot of the Canary and Azore Islands from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

Figure 73: Plot of the Caribbean Sea and Gulf of Mexico from the unmodified $1/8^\circ$ global topography.

Figure 74: Plot of the Caribbean Sea and Gulf of Mexico from the $1/12^\circ$ ETOPO5 topography.

Figure 75: Plot of the Caribbean Sea and Gulf of Mexico from the new $1/8^\circ$ Atlantic topography.

Figure 76: Plot of the Caribbean Sea and Gulf of Mexico from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

Figure 77: Plot of the Mediterranean Sea from the unmodified $1/8^\circ$ global topography.

Figure 78: Plot of the Mediterranean Sea from the $1/12^\circ$ ETOPO5 topography.

Figure 79: Plot of the Mediterranean Sea from the new $1/8^\circ$ Atlantic topography.

Figure 80: Plot of the Mediterranean Sea from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

Figure 81: Plot of the Drake Passage and the Falkland Islands from the unmodified $1/8^\circ$ global topography.

Figure 82: Plot of the Drake Passage and the Falkland Islands from the $1/12^\circ$ ETOPO5 topography.

Figure 83: Plot of the Drake Passage and the Falkland Islands from the new $1/8^\circ$ global topography.

Figure 84: Plot of the Drake Passage and the Falkland Islands from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 85: Plot of the Arabian Sea from the unmodified $1/8^\circ$ global topography.

Figure 86: Plot of the Arabian Sea from the $1/12^\circ$ ETOPO5 topography.

Figure 87: Plot of the Arabian Sea from the new $1/8^\circ$ global topography.

Figure 88: Plot of the Arabian Sea from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 89: Plot of the Southwestern Indian Ocean from the unmodified $1/8^\circ$ global topography.

Figure 90: Plot of the Southwestern Indian Ocean from the $1/12^\circ$ ETOPO5 topography.

Figure 91: Plot of the Southwestern Indian Ocean from the new $1/8^\circ$ global topography.

Figure 92: Plot of the Southwestern Indian Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 93: Plot of the Andaman Sea from the unmodified $1/8^\circ$ global topography.

Figure 94: Plot of the Andaman Sea from the $1/12^\circ$ ETOPO5 topography.

Figure 95: Plot of the Andaman Sea from the new $1/8^\circ$ global topography.

Figure 96: Plot of the Andaman Sea from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 97: Plot of the Indonesian Throughflow region from the unmodified $1/8^\circ$ global topography.

Figure 98: Plot of the Indonesian Throughflow region from the $1/12^\circ$ ETOPO5 topography.

Figure 99: Plot of the Indonesian Throughflow region from the new $1/8^\circ$ global topography.

Figure 100: Plot of the Indonesian Throughflow region from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 101: Plot of New Zealand from the unmodified $1/8^\circ$ global topography.

Figure 102: Plot of New Zealand from the $1/12^\circ$ ETOPO5 topography.

Figure 103: Plot of New Zealand from the new $1/8^\circ$ global topography.

Figure 104: Plot of New Zealand from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Figure 105: Plot of Aleutian Island sill depth locations listed in table 1.

Figure 106: Plot of Southwest Pacific Ocean sill depth locations listed in table 1.

Figure 107: Plot of E China Sea sill depth locations listed in table 1.

Figure 108: Plot of Izu Ridge sill depth locations listed in table 1.

Figure 109: Plot of Kuril Island sill depth locations listed in table 1.

Figure 110: Plot of Caribbean Sea and Leeward Island sill depth location listed in table 2.

Figure 111: Plot of GIN Sea sill depth location listed in table 2.

Figure 112: Plot of Mediterranean Sea sill depth locations listed in table 3.

Figure 113: Plot of New Zealand sill depth location listed in table 3.

Figure 114: Plot of Falkland Island sill depth location listed in table 3.

Figure 115: Plot of Arabian Sea sill depth location listed in table 4.

Figure 116: Plot of Andaman Sea sill depth location listed in table 4.

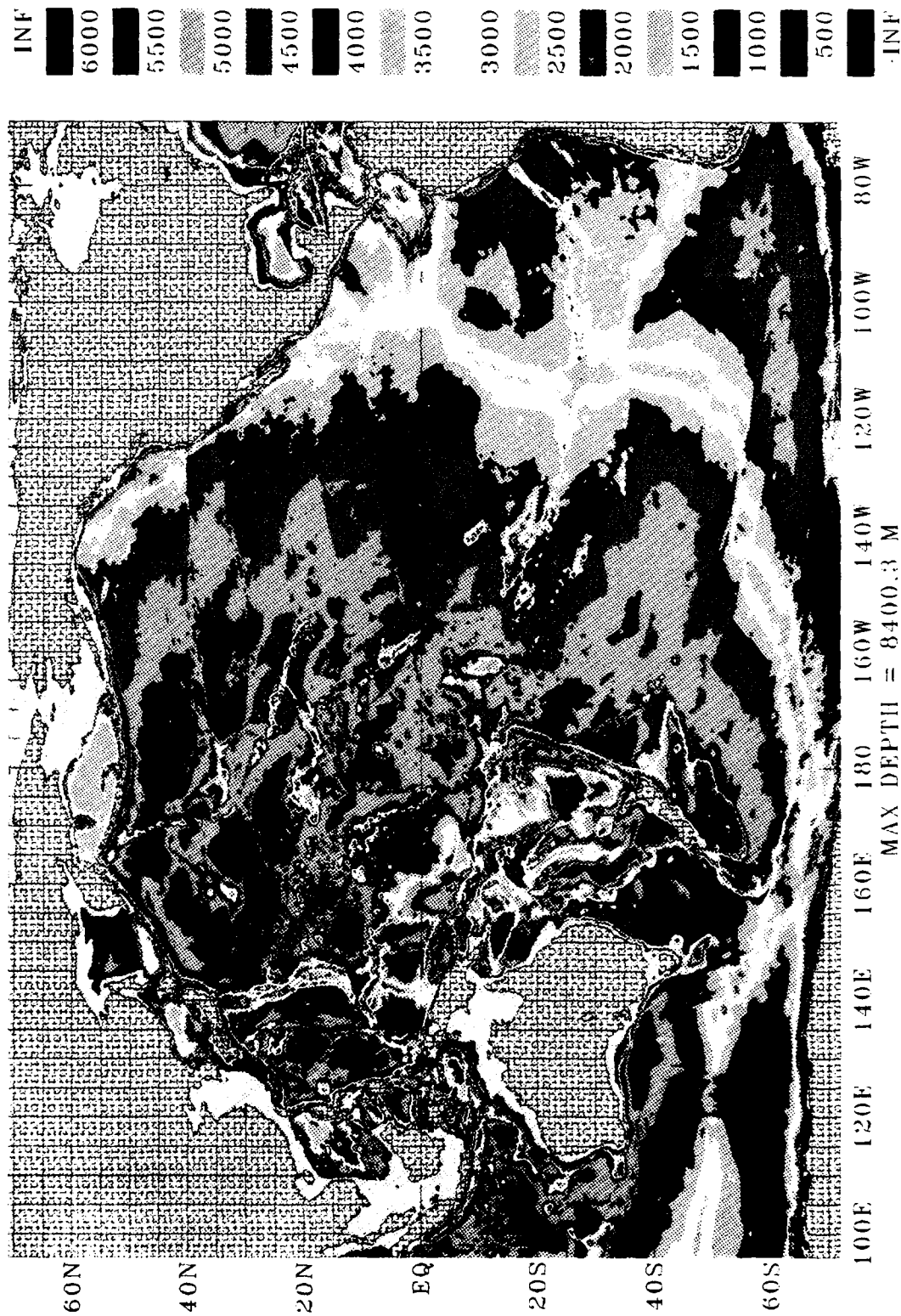
Figure 117: Plot of Indonesian Throughflow sill depth location listed in table 4.

Figure 118: Plot of Southwest Indian Ocean sill depth location listed in table 4.

w117a2 topography

DX,DY = 0.176,0.125 DEG DB = 500.0 M

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Figure 1: Plot of the Pacific Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

w117a2 topography

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DX,DY = 0.176,0.125 DEG DB = 500.0 M

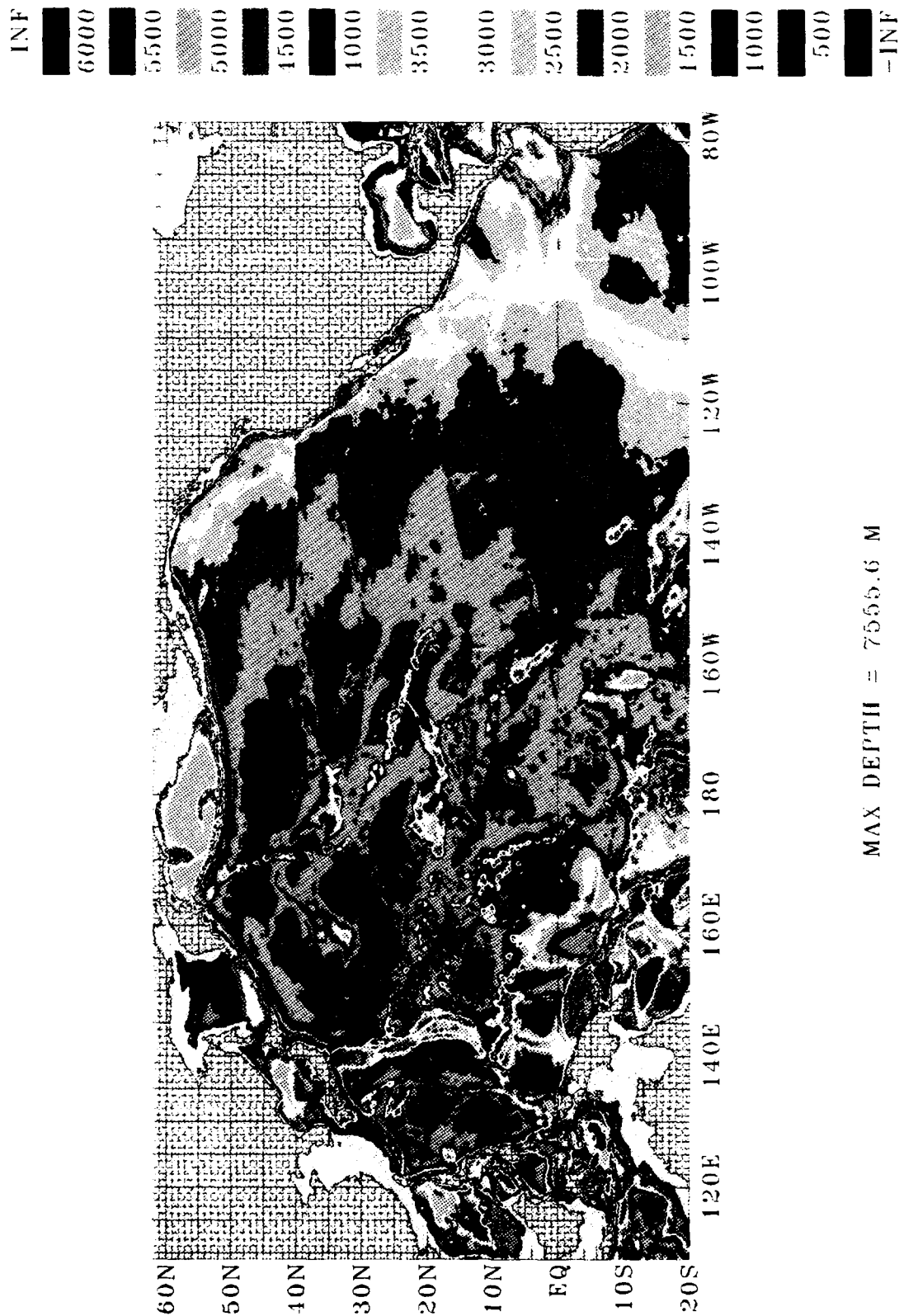
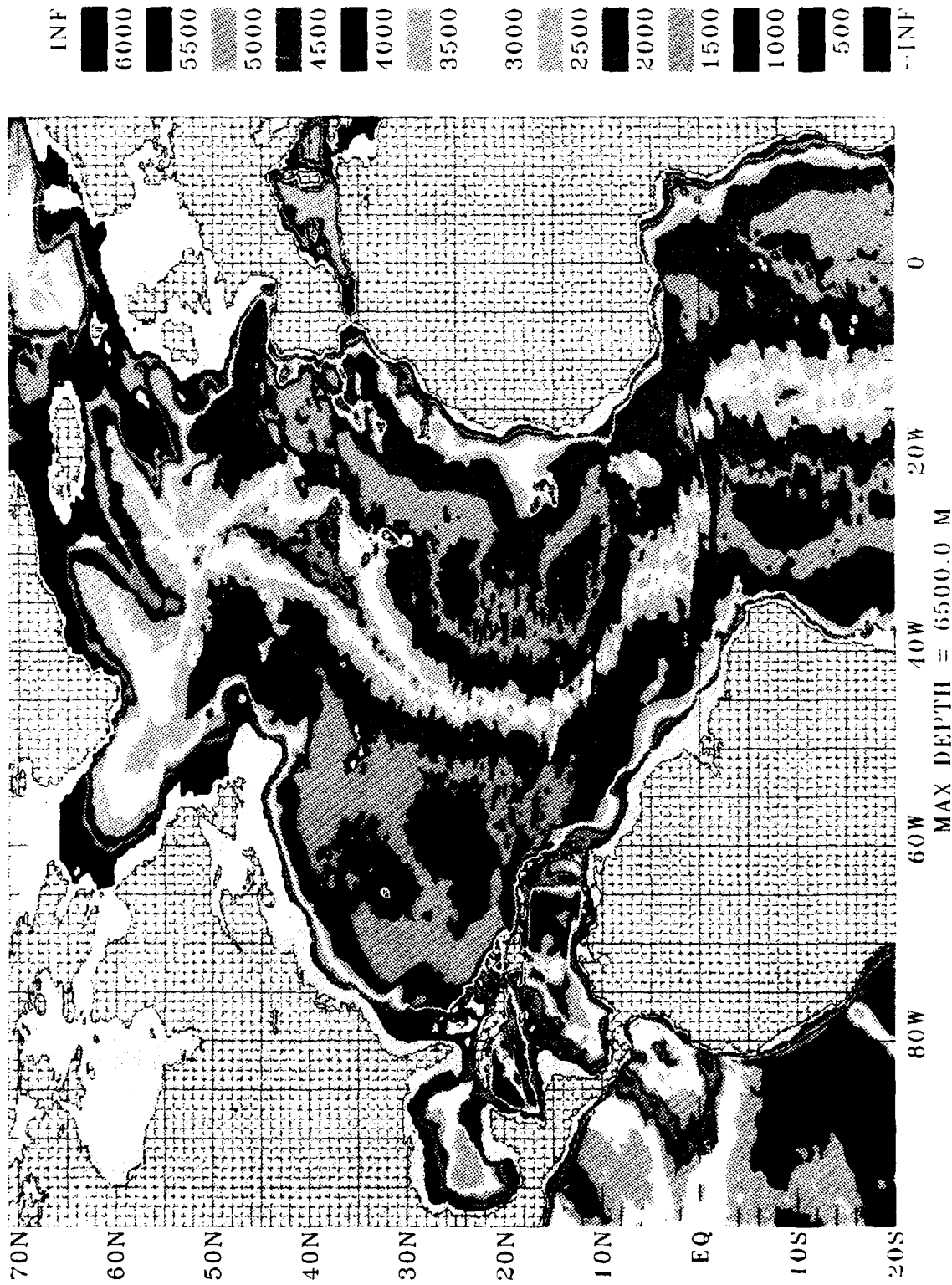


Figure 2: Plot of the North Pacific Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

w117a topography

DX,DY = 0.176,0.125 DEG DB = 500.0 M

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Figure 3: Plot of the North Atlantic Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

BATHYMETRIC DATA
 DX,DY = 0.176,0.125 DEG DB = 500.0 M

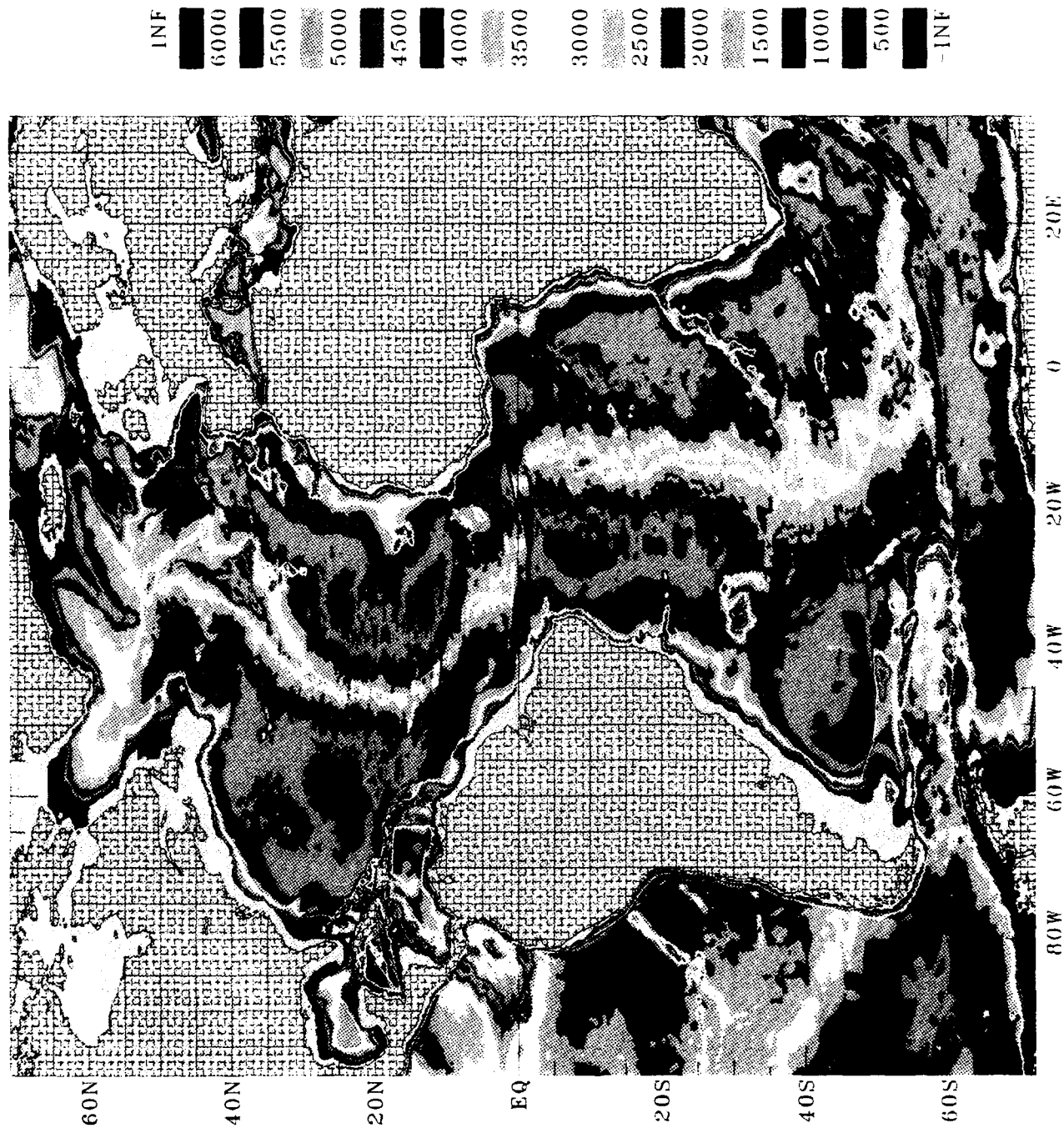


Figure 4: Plot of the Atlantic Ocean from the new 1/8° global topography which has been smoothed by two passes of a 9-point smoother.

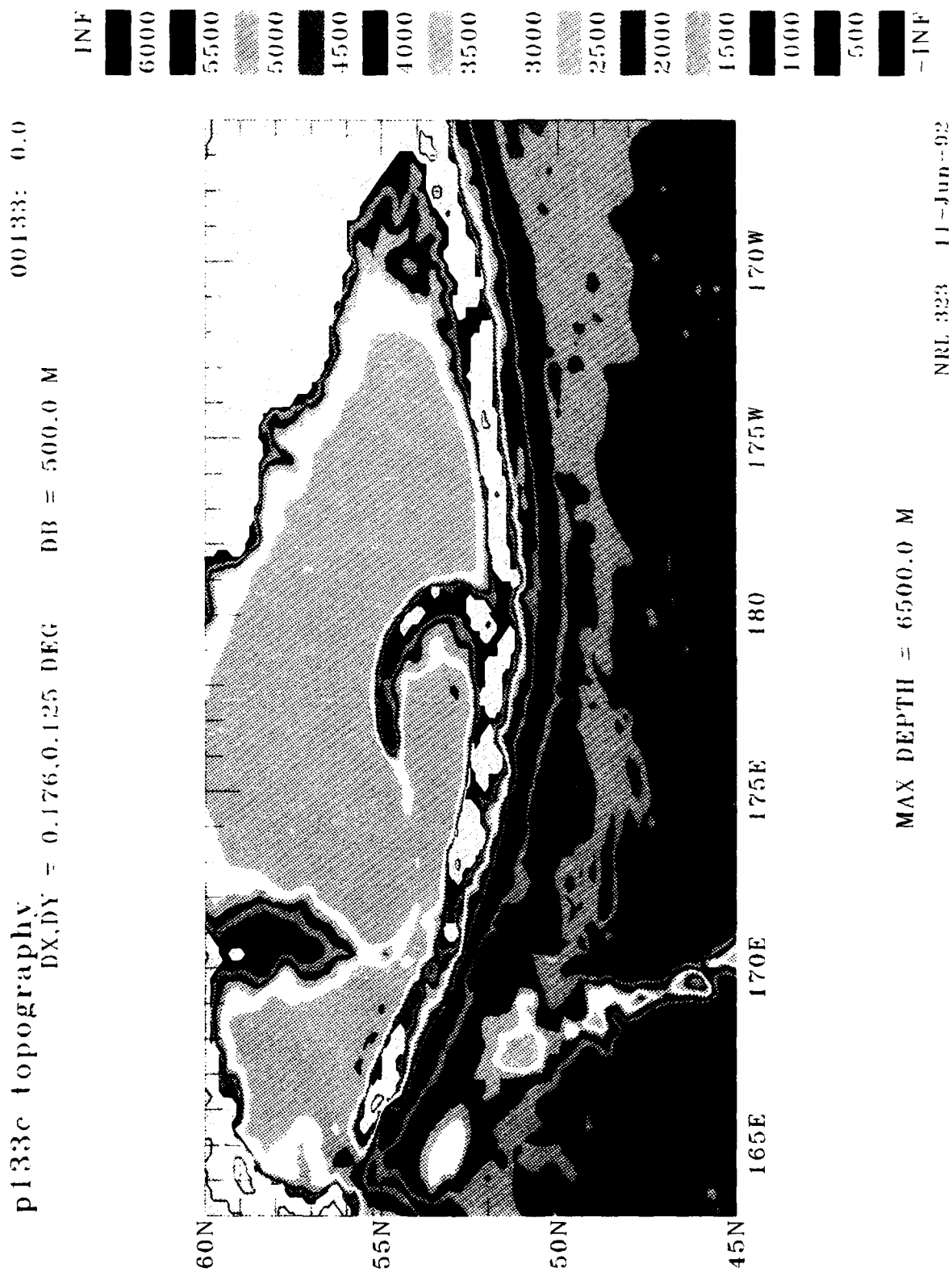
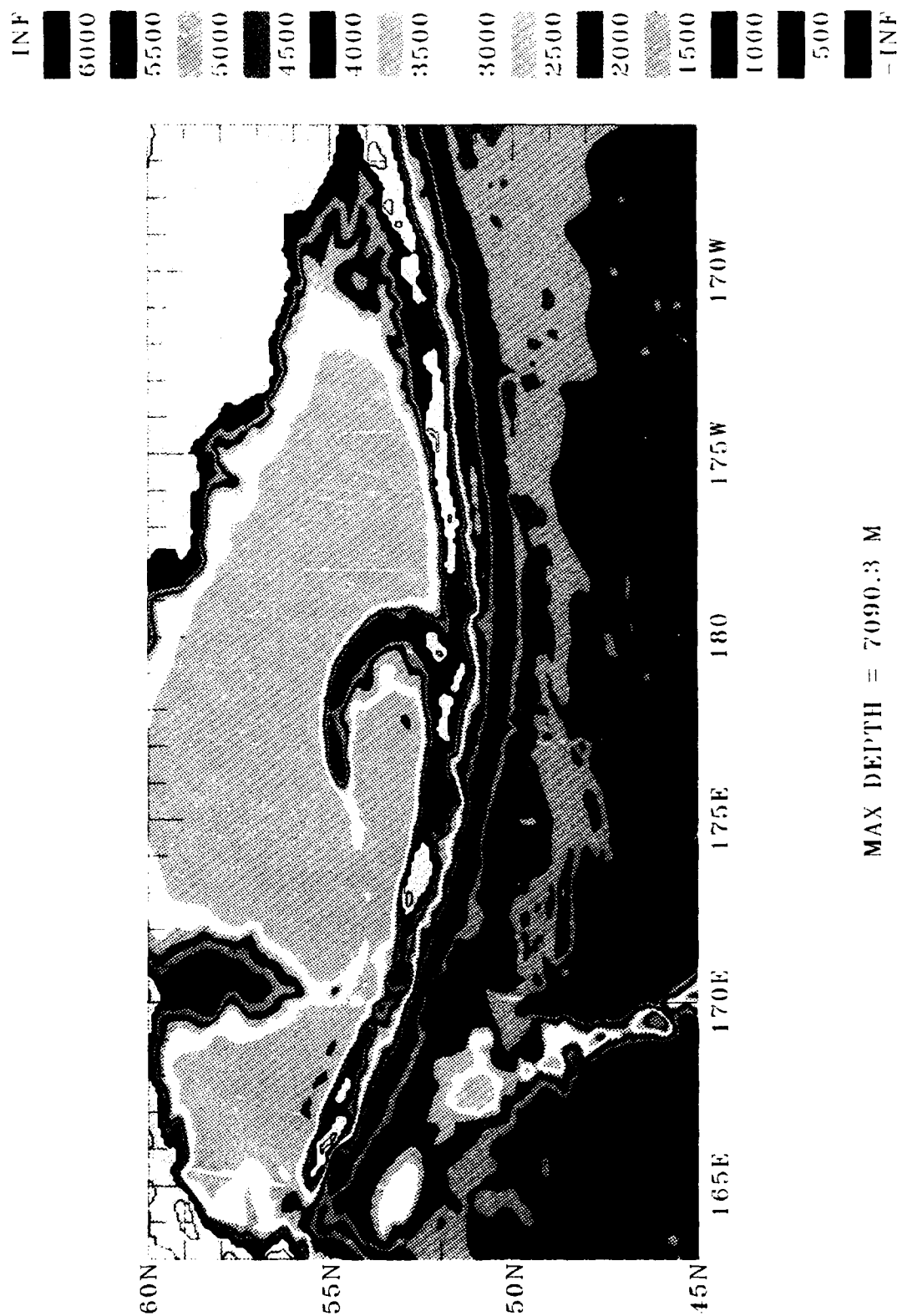


Figure 5: Plot of the Aleutian Islands from the unmodified $1/8^\circ$ Pacific topography.

ETOPO5 topography
 DX,DY = 0.083,0.083 DEG DB = 500.0 M 00999: 0.0



MAX DEPTH = 7090.3 M

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Figure 6: Plot of the Aleutian Islands from the 1/12° ETOPO5 topography.

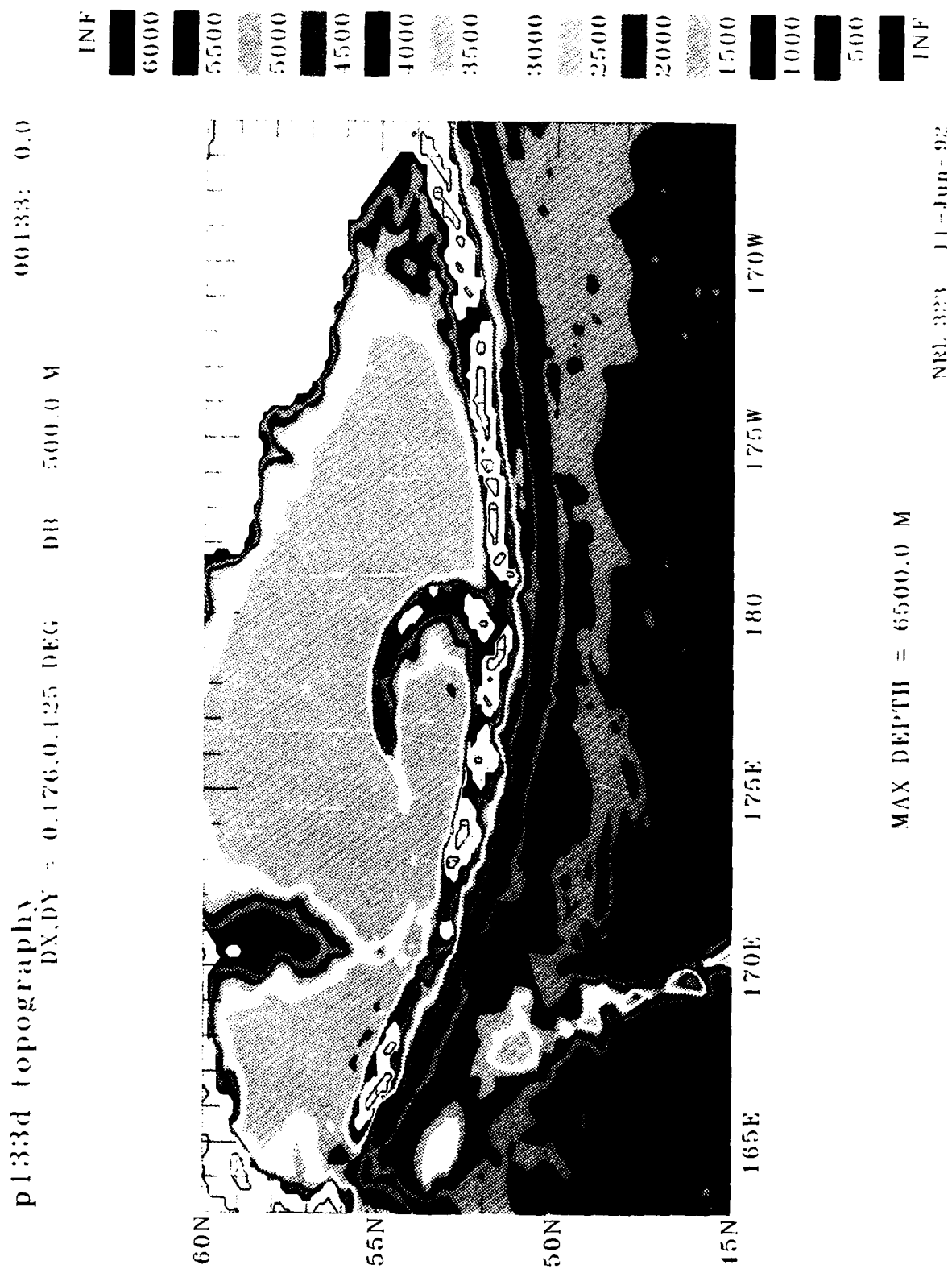


Figure 7: Plot of the Aleutian Islands from the new 1/8° Pacific topography.

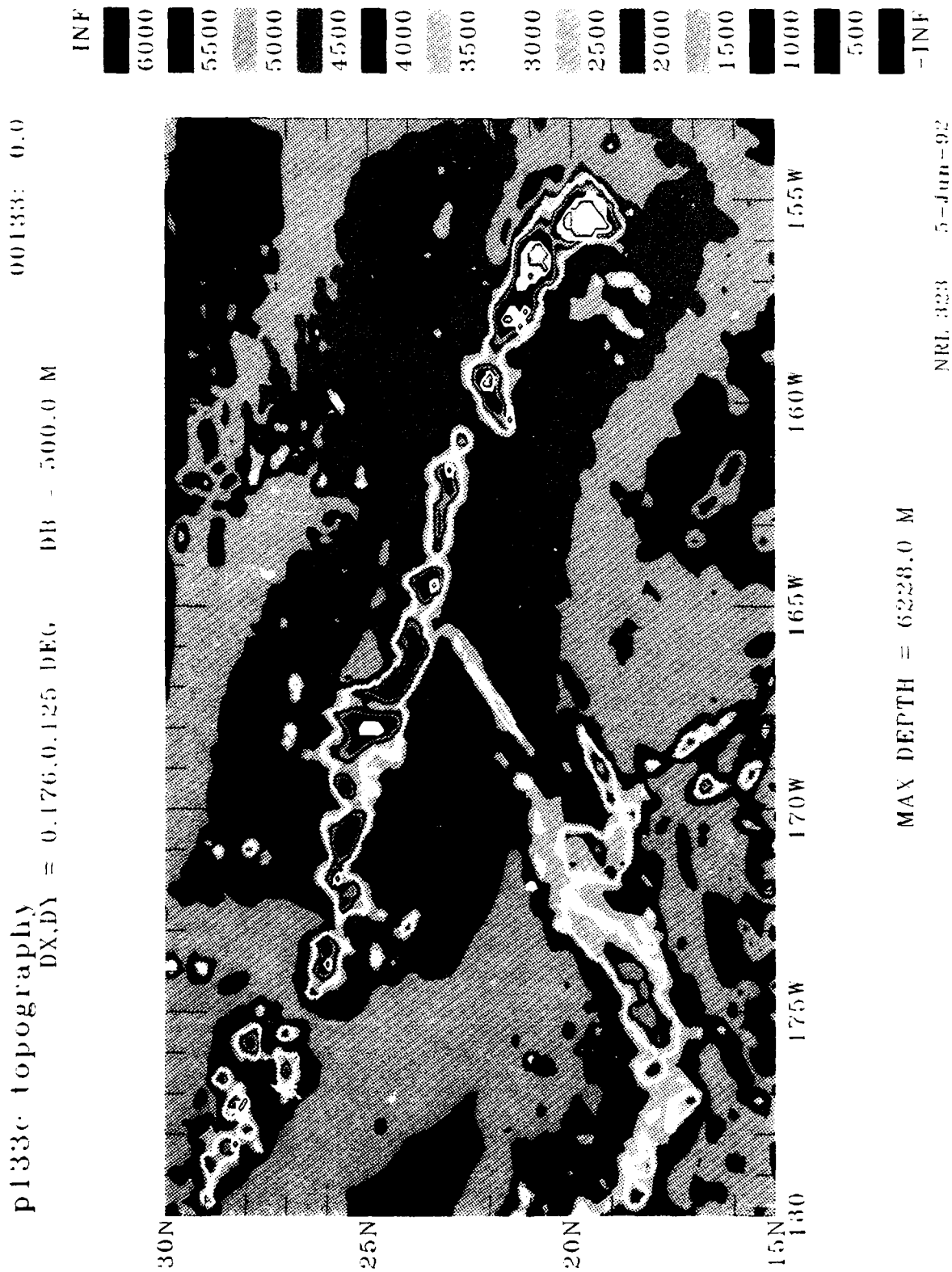


Figure 9: Plot of the Hawaiian Islands and the shoals to the northwest from the unmodified $1/8^\circ$ Pacific topography.

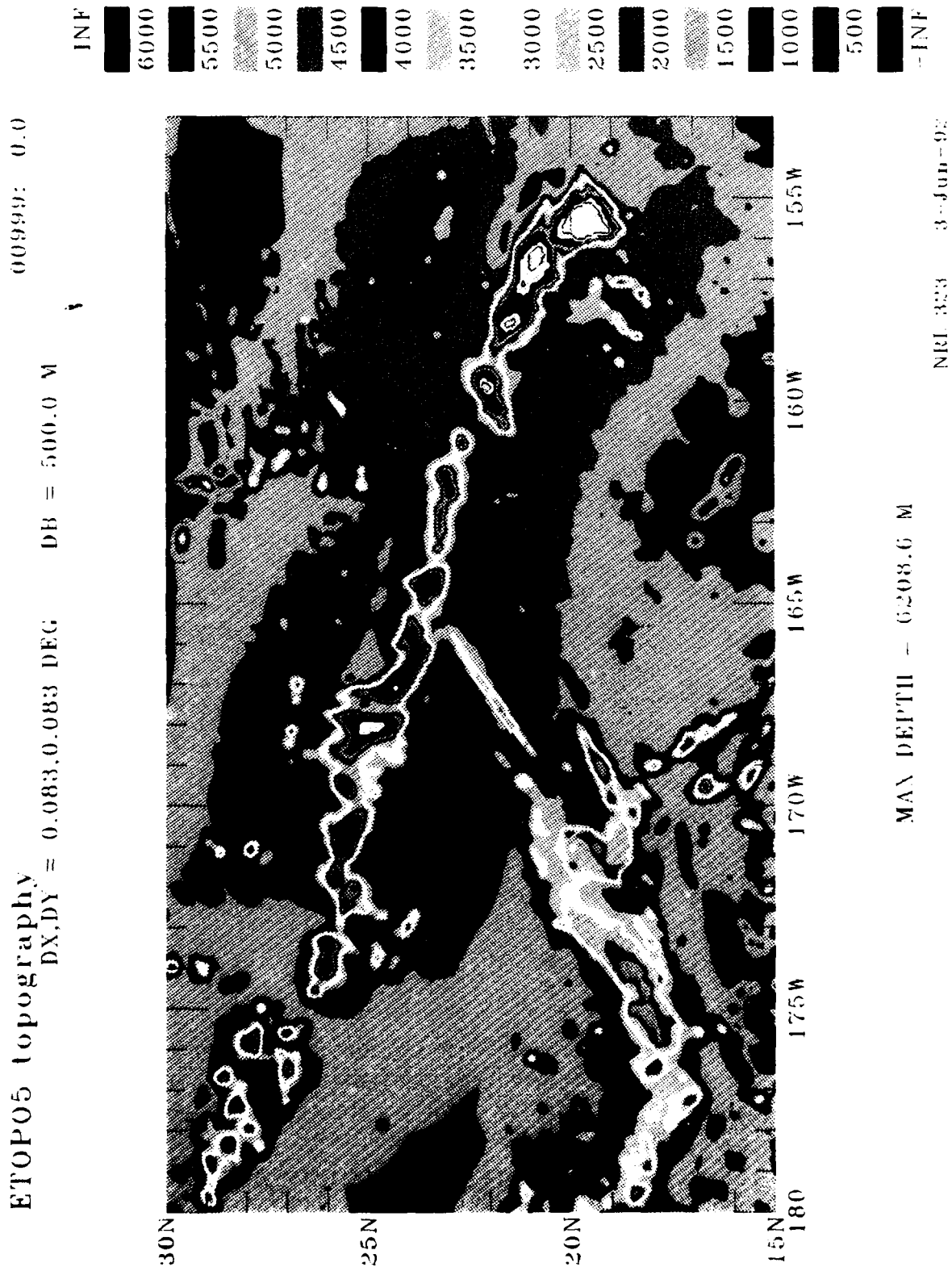
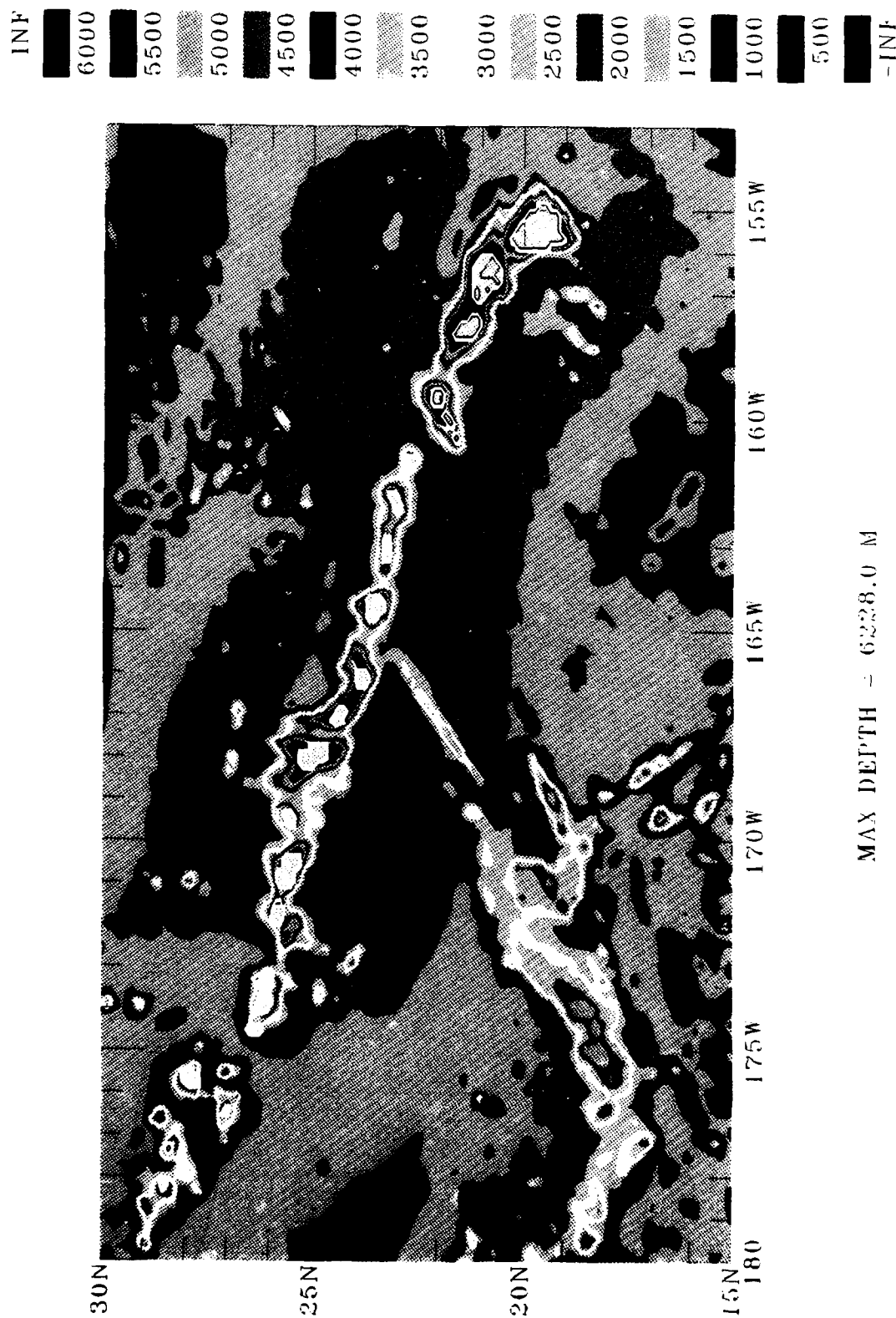


Figure 10: Plot of the Hawaiian Islands and the shoals to the northwest from the 1/12° ETOPO5 topography.

p133d topography

00133: 0.0

DX,DY = 0.176,0.125 DEG DB = 500.0 M



MAX DEPTH = 6228.0 M

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Figure 11: Plot of the Hawaiian Islands and the shoals to the northwest from the new 1/8° Pacific topography

p133d2 topography

00133: 0.0

DX,DY = 0.176,0.125 DEG DB = 500.0 M



Figure 12: Plot of the Hawaiian Islands and the shoals to the northwest from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

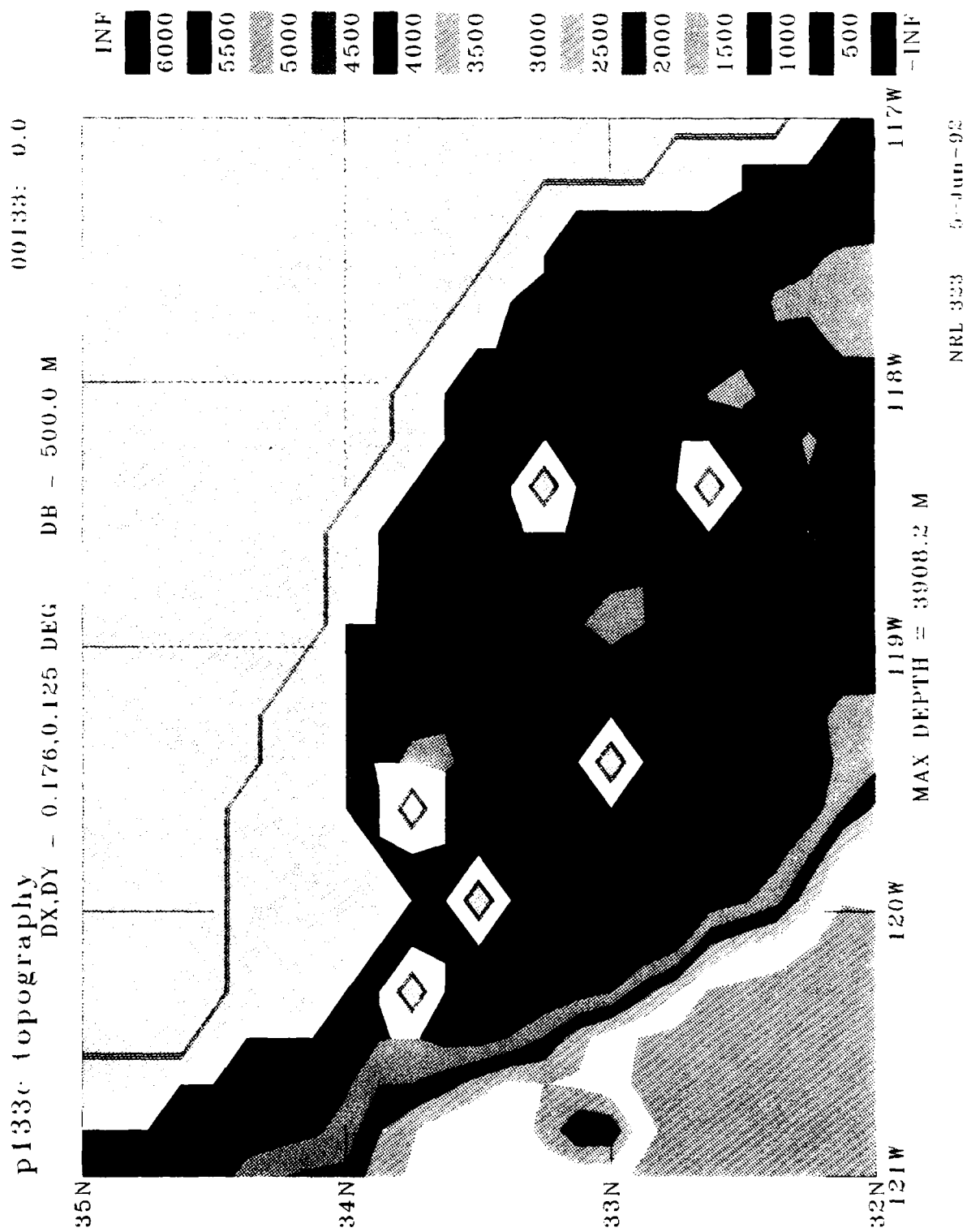
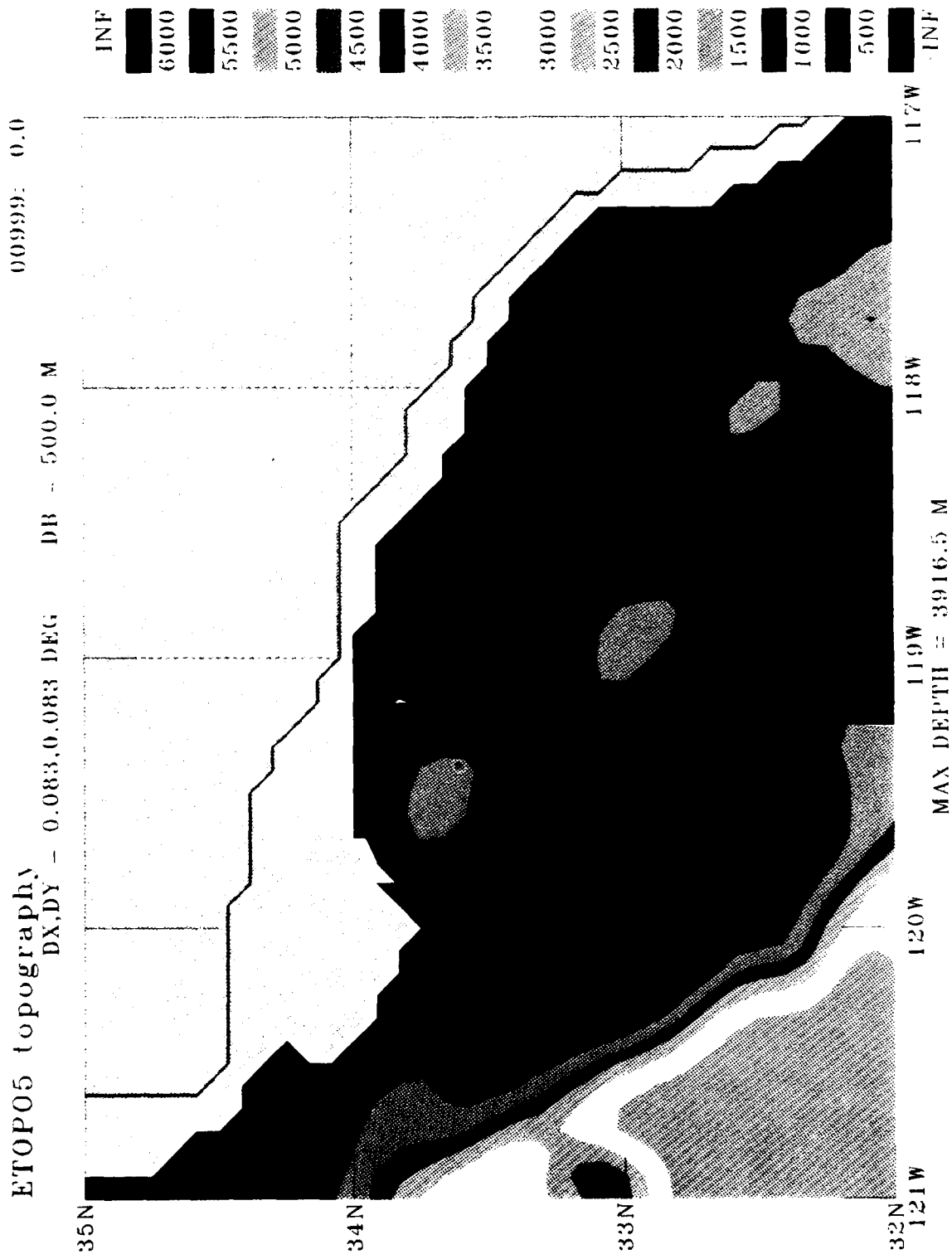


Figure 13: Plot of the Channel Islands west of Los Angeles, California from the unmodified $1/8^\circ$ Pacific topography.



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Figure 14: Plot of the Channel Islands west of Los Angeles, California from the 1/12° ETOPO5 topography.

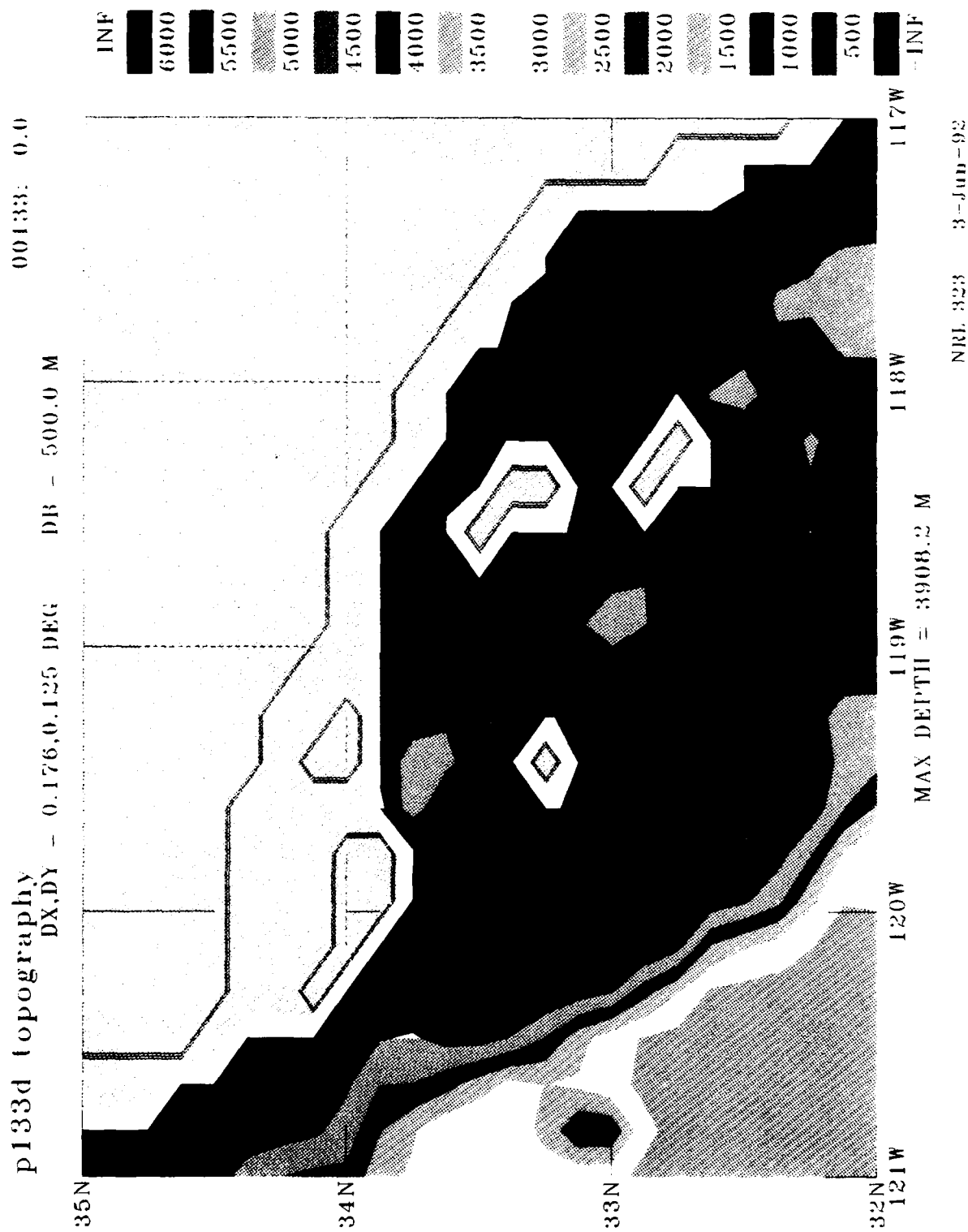


Figure 15: Plot of the Channel Islands west of Los Angeles, California from the new 1/8° Pacific topography.

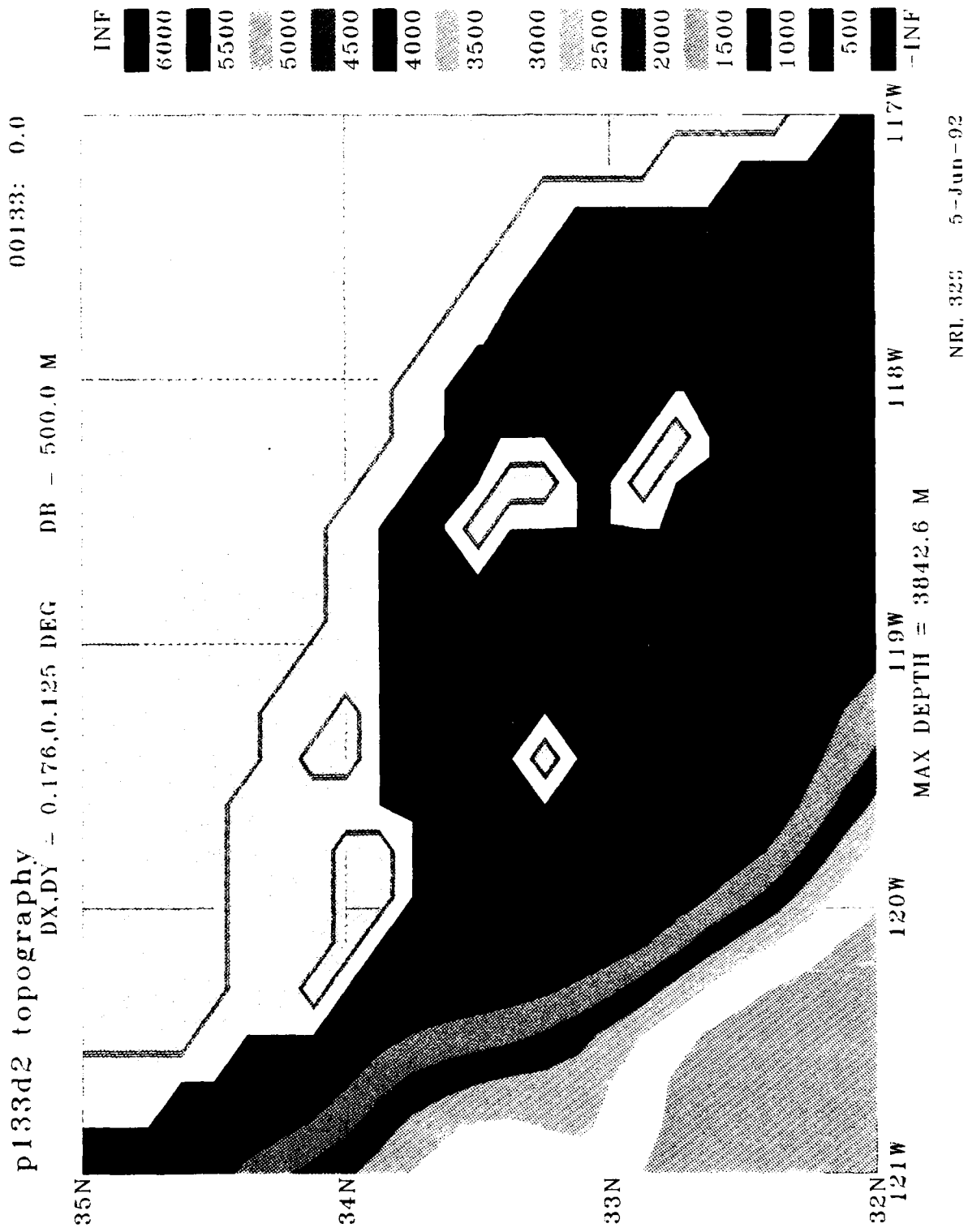


Figure 16: Plot of the Channel Islands west of Los Angeles, California from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

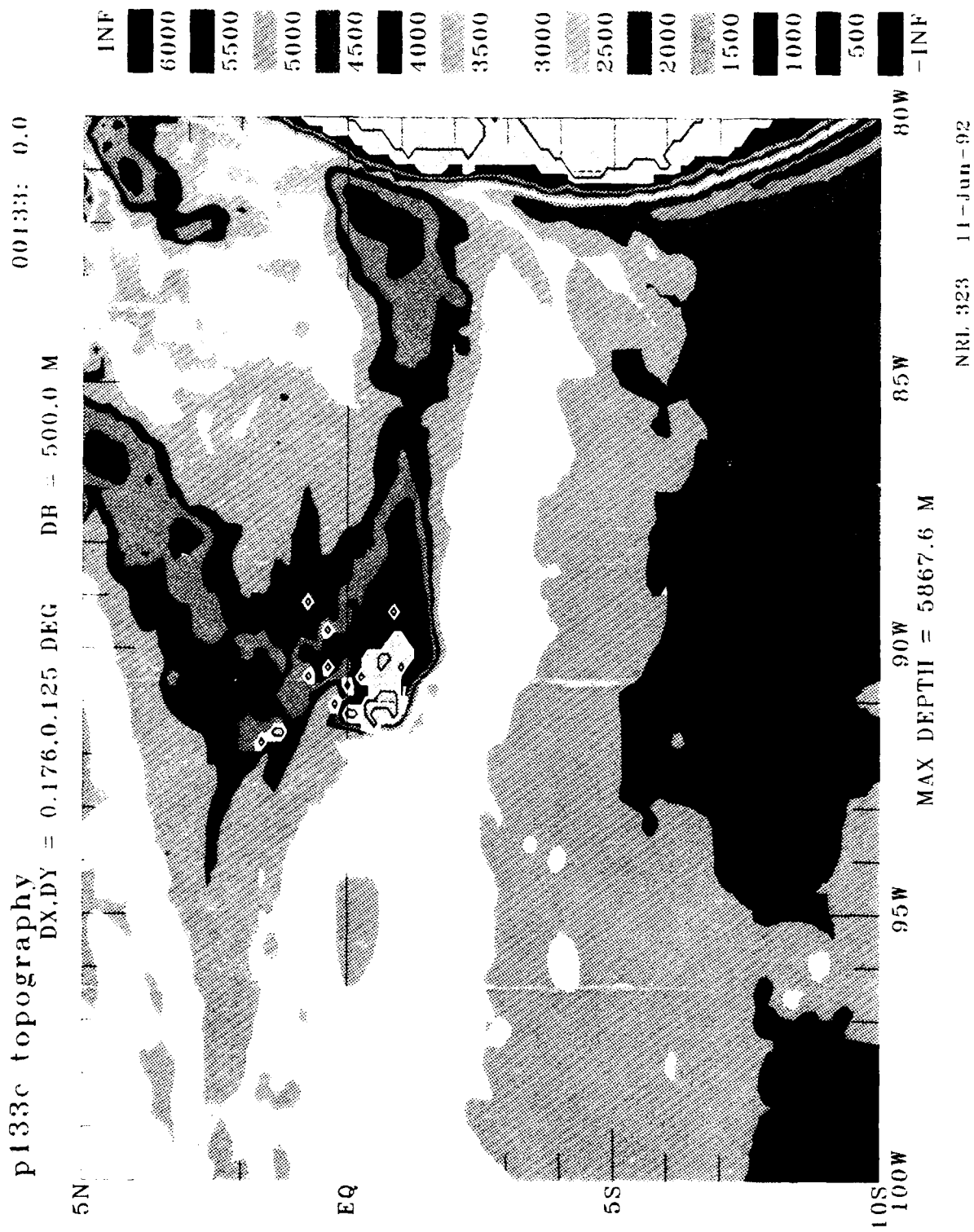


Figure 17: Plot of the Galapagos Islands from the unmodified 1/8° Pacific topography.

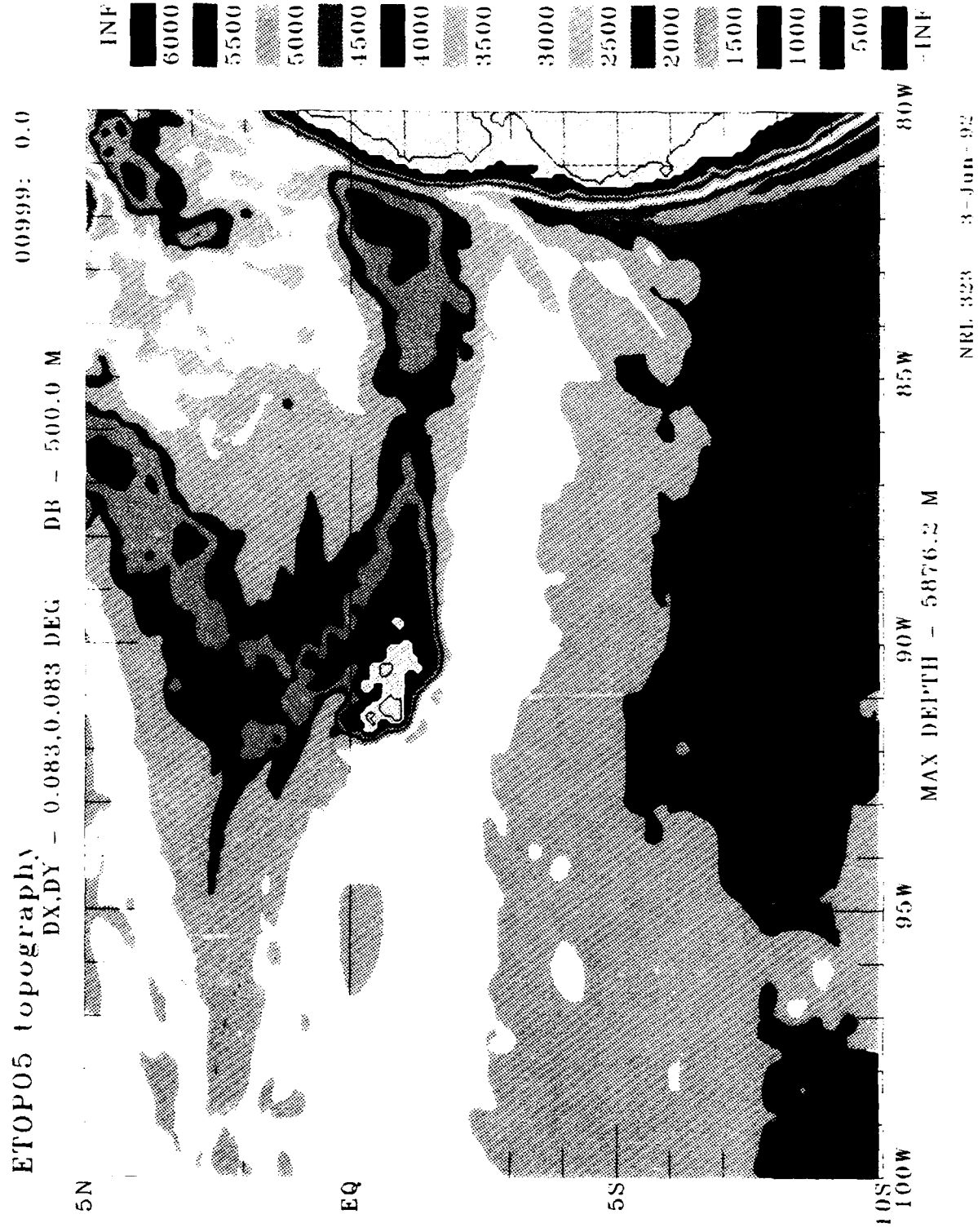


Figure 18: Plot of the Galapagos Islands from the 1/12° ETOPO5 topography.

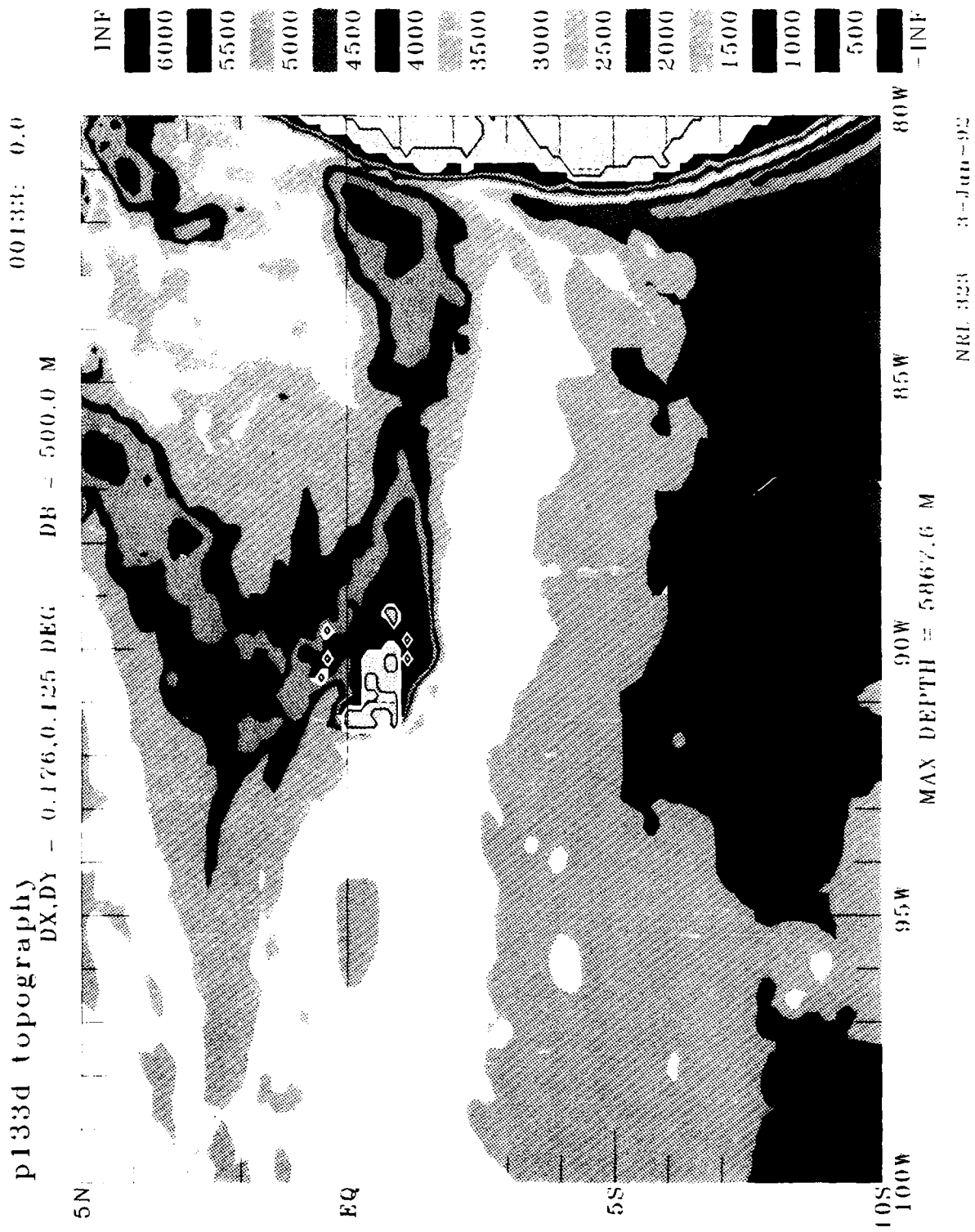


Figure 19: Plot of the Galapagos Islands from the new $1/8^\circ$ Pacific topography.

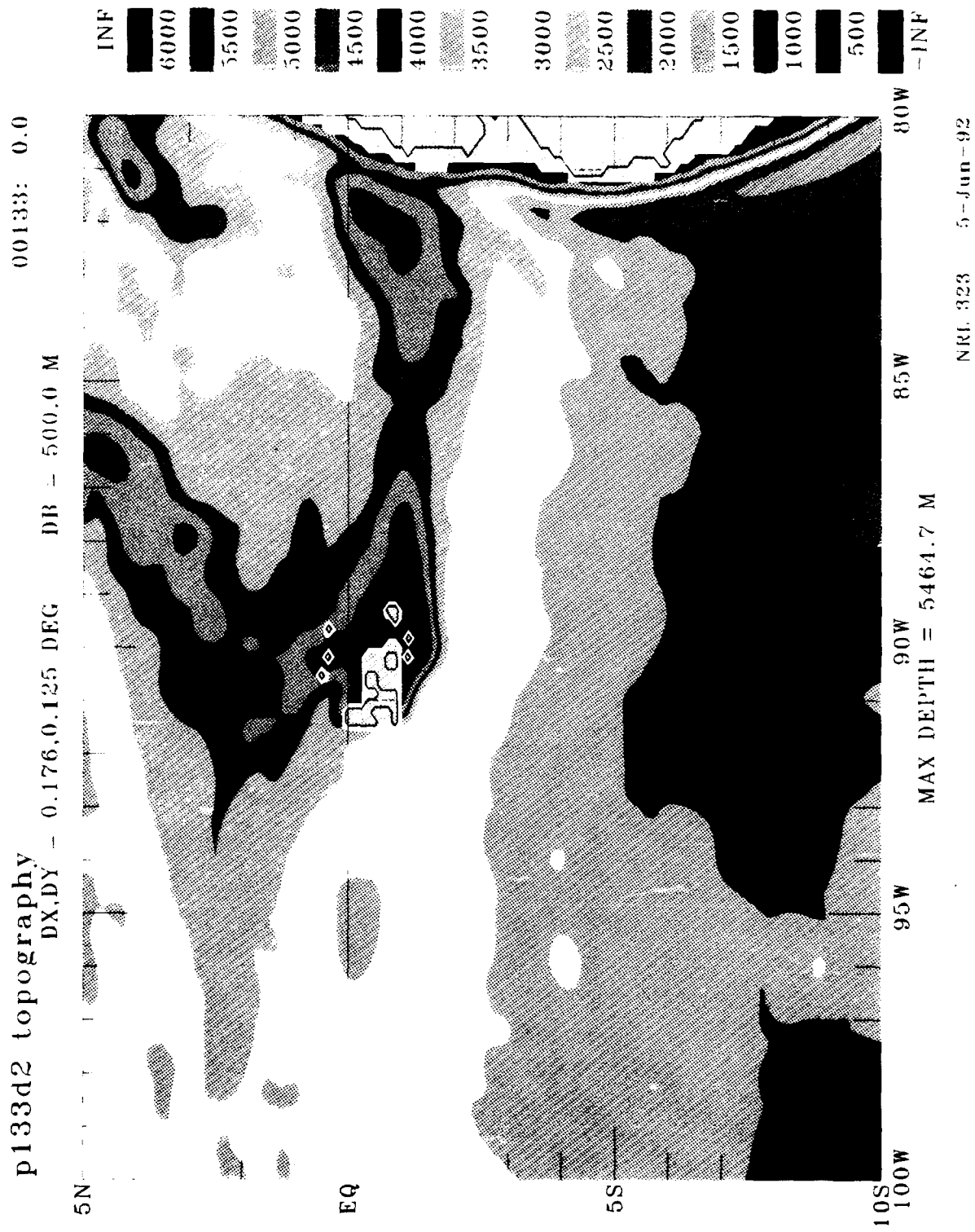


Figure 20: Plot of the Galapagos Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

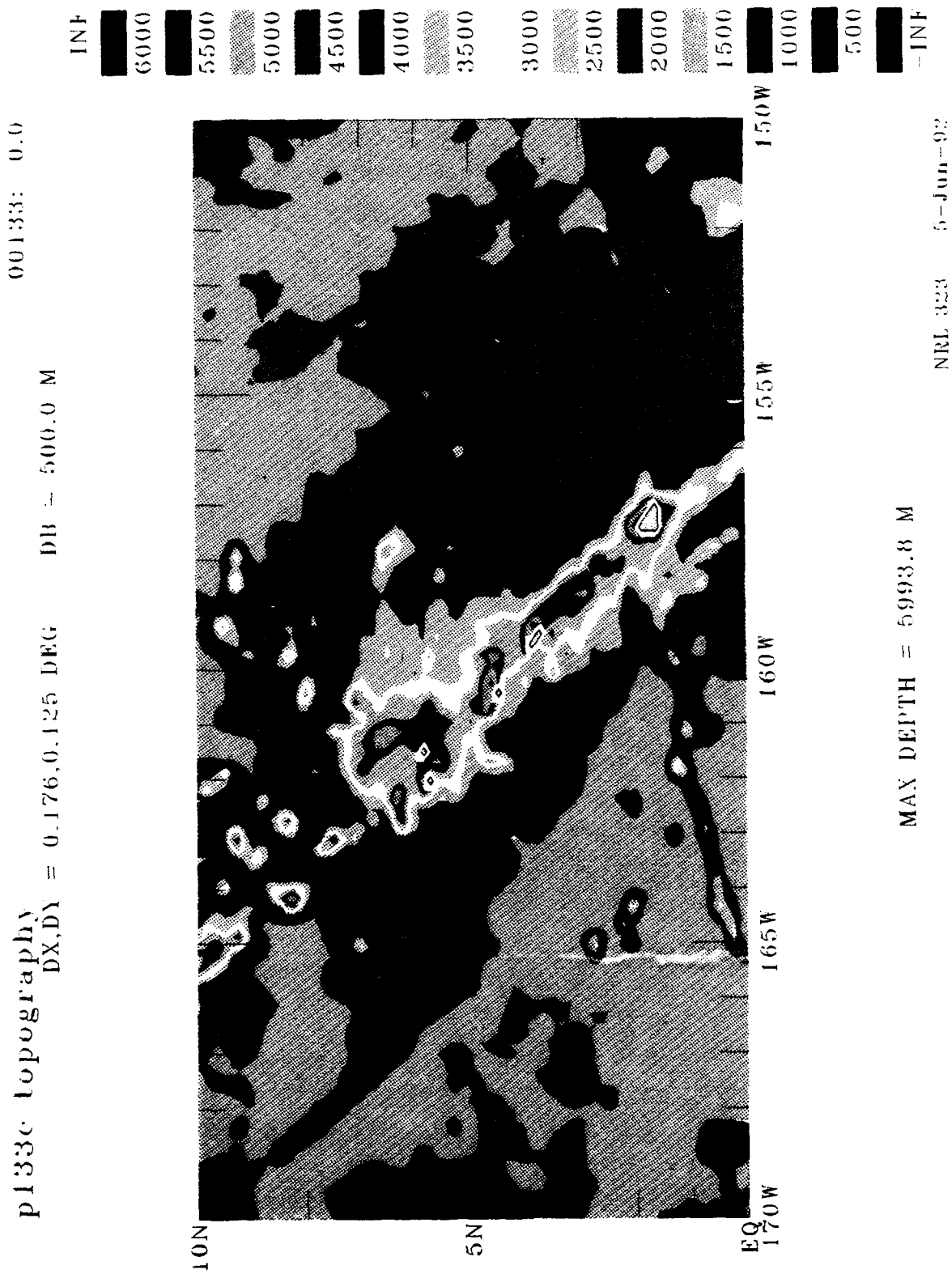
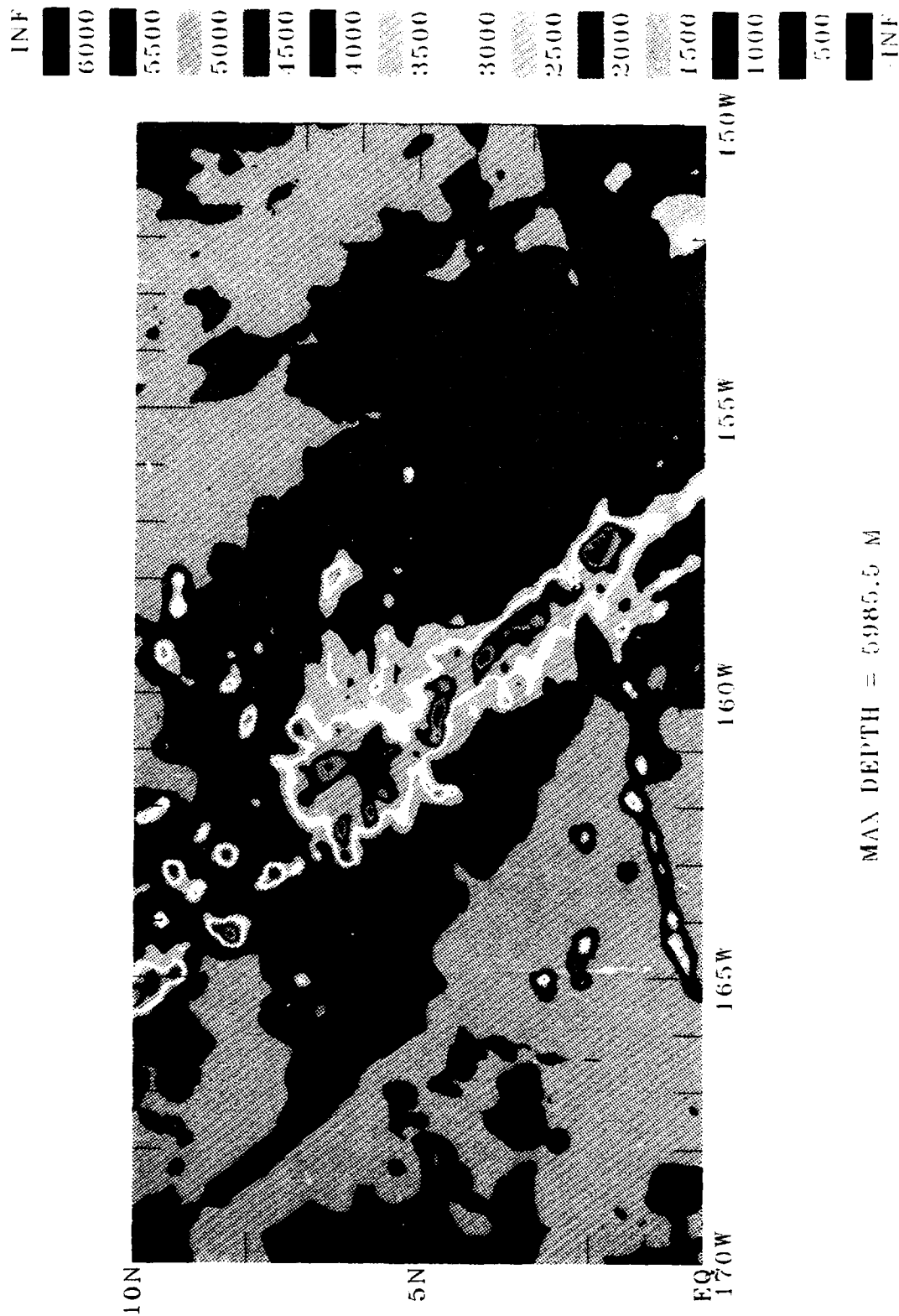


Figure 21: Plot of the Line Islands from the unmodified 1/8° Pacific topography.

ETOPO5 topography

DX,DY = 0.083,0.083 DEG DB = 500.0 M

00999: 0.0



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Figure 22: Plot of the Line Islands from the 1/12° ETOPO5 topography.

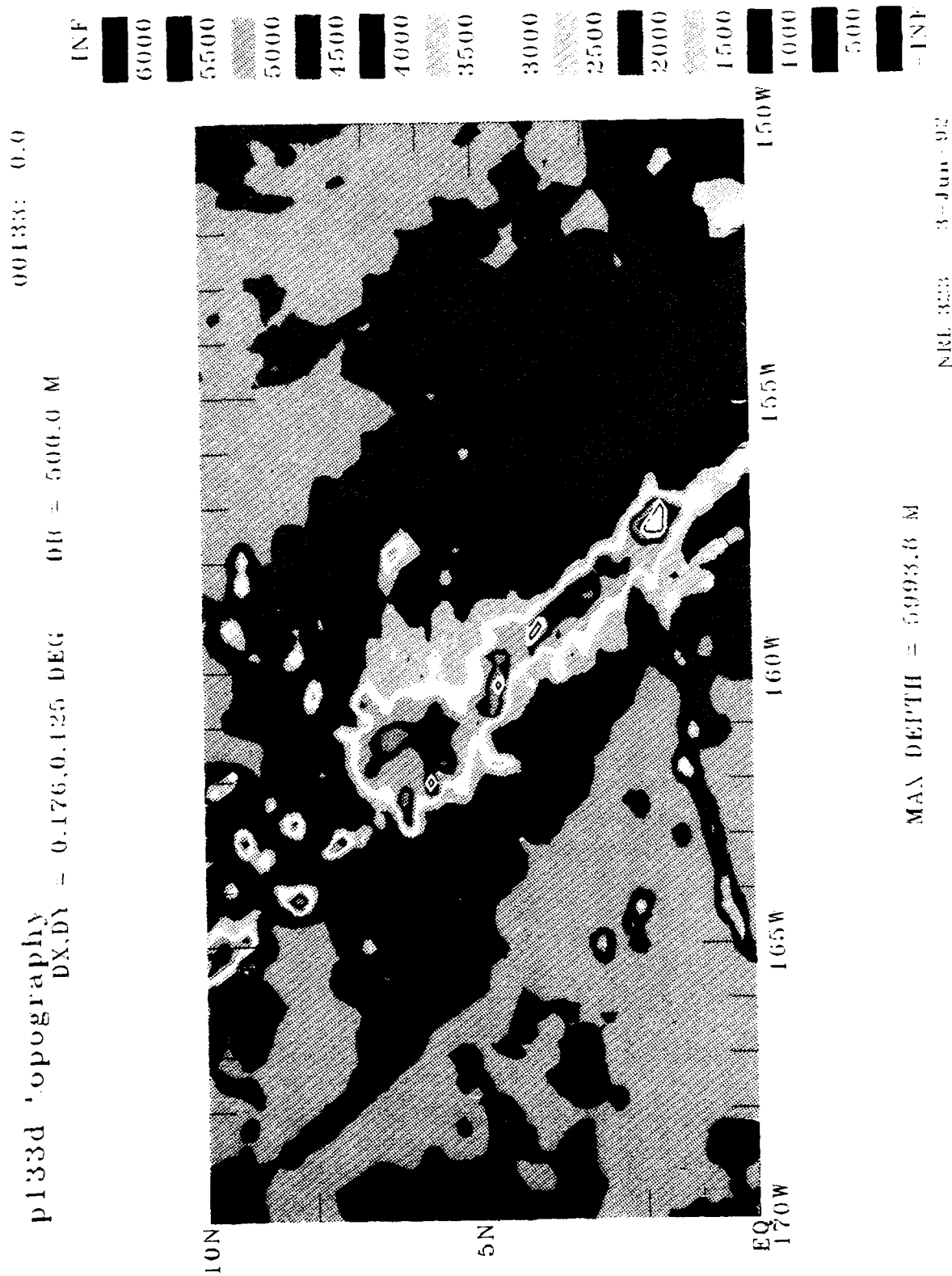


Figure 23: Plot of the Line Islands from the new 1/8° Pacific topography.

p133d2 topography

DX,DY = 0.176,0.125 DEG

DR = 500.0 M

00133: 0.0

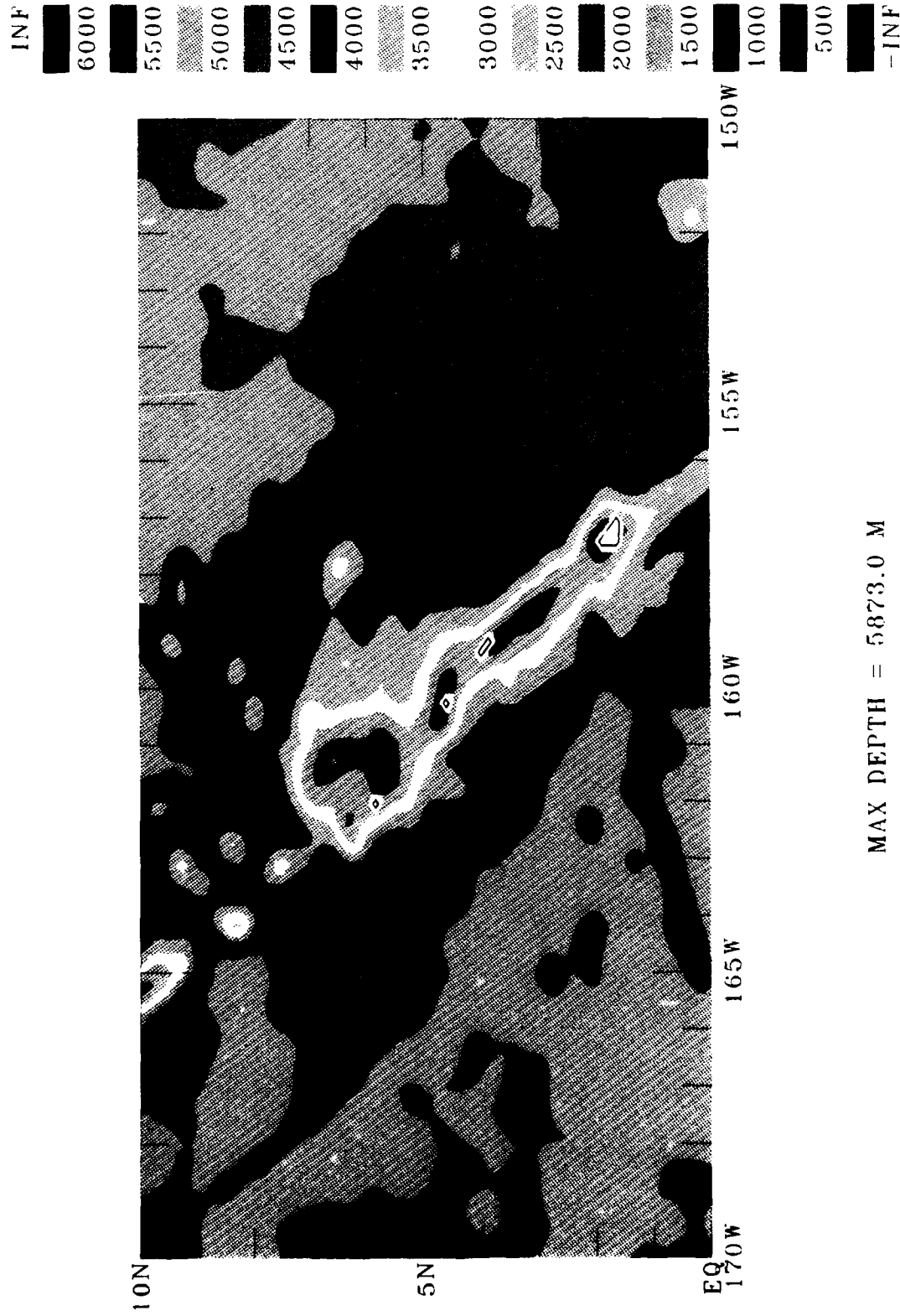


Figure 24: Plot of the Line Islands from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

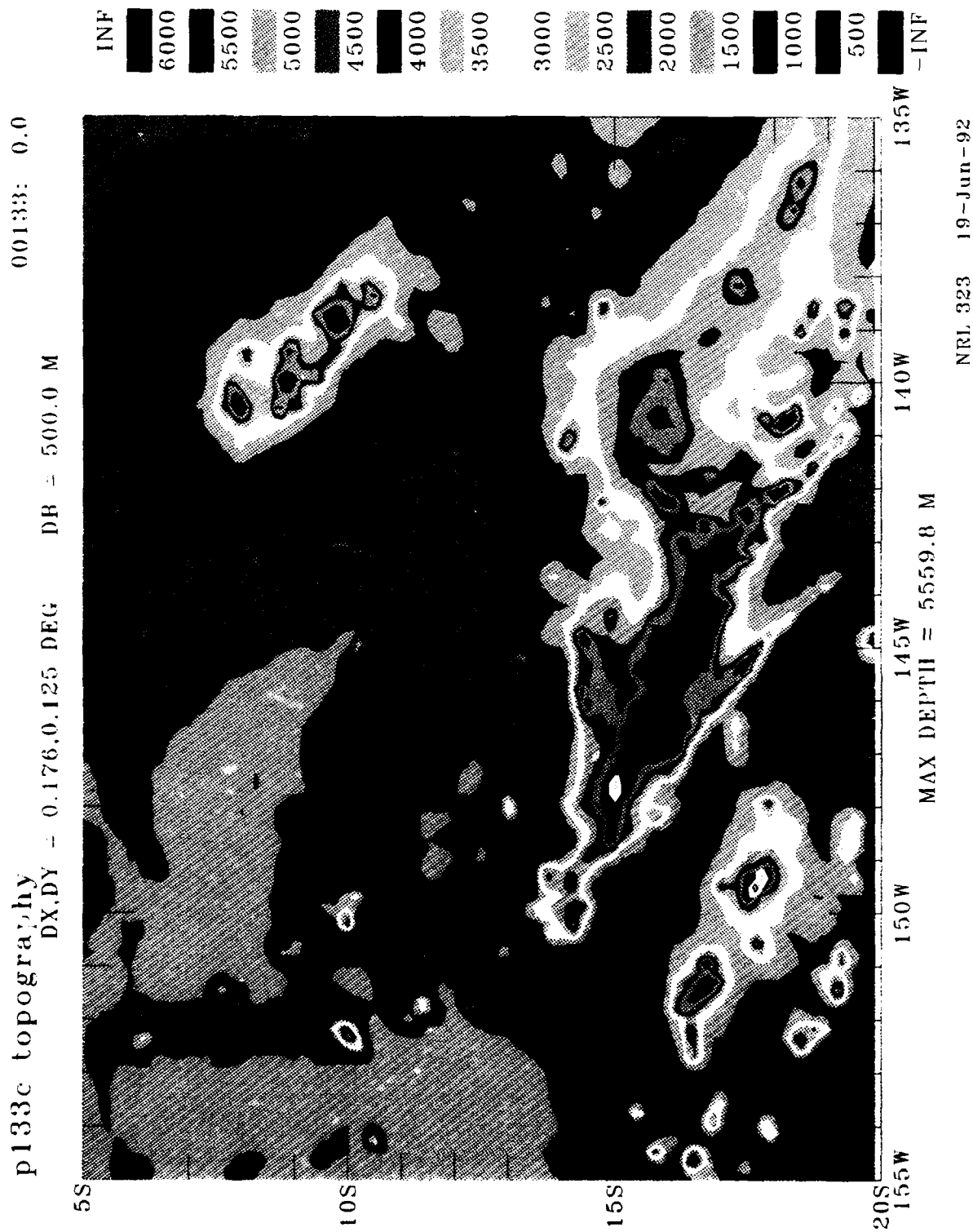


Figure 25: Plot of the Samoan Islands from the unmodified 1/8° Pacific topography.

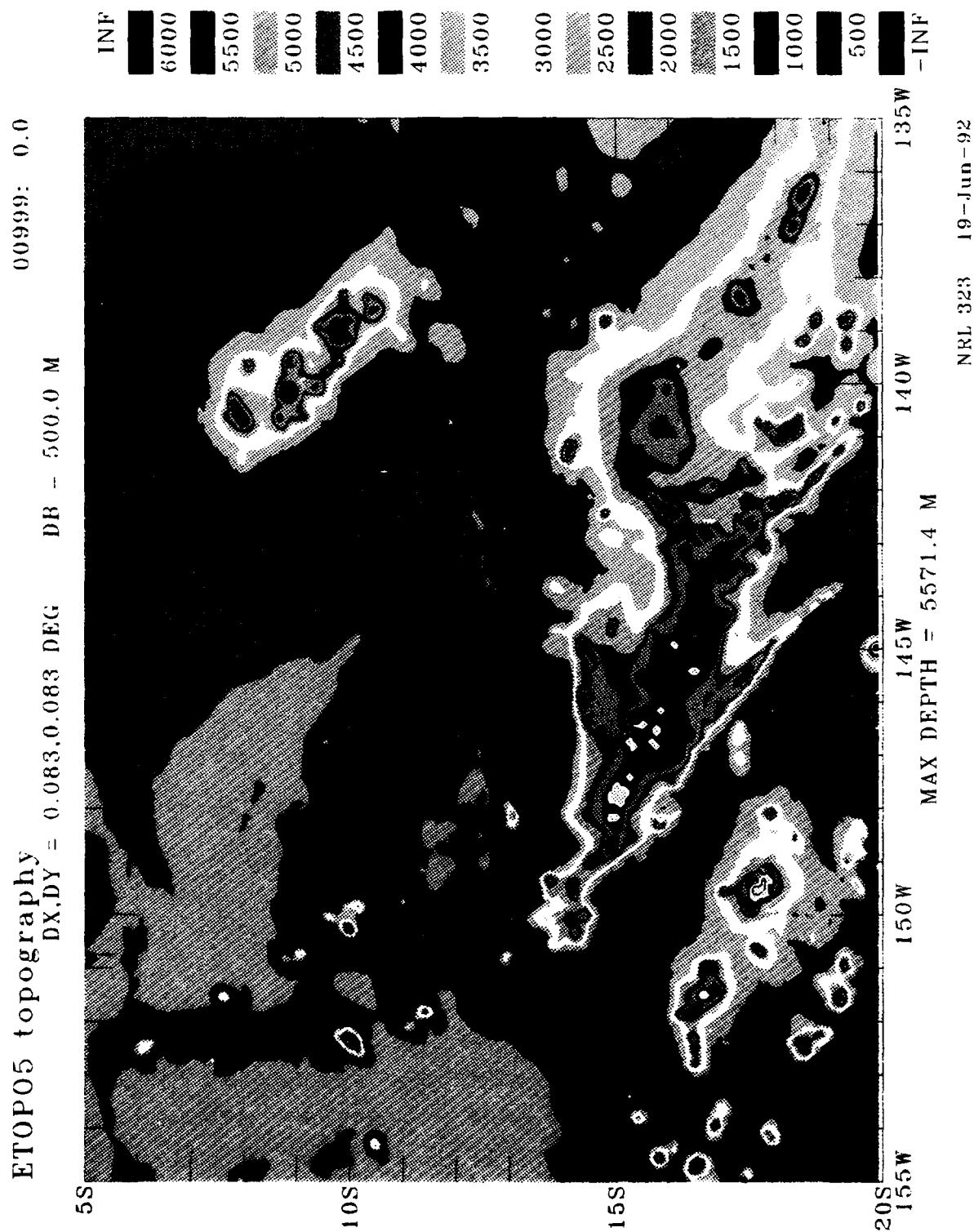


Figure 26: Plot of the Samoan Islands from the 1/12° ETOPO5 topography.

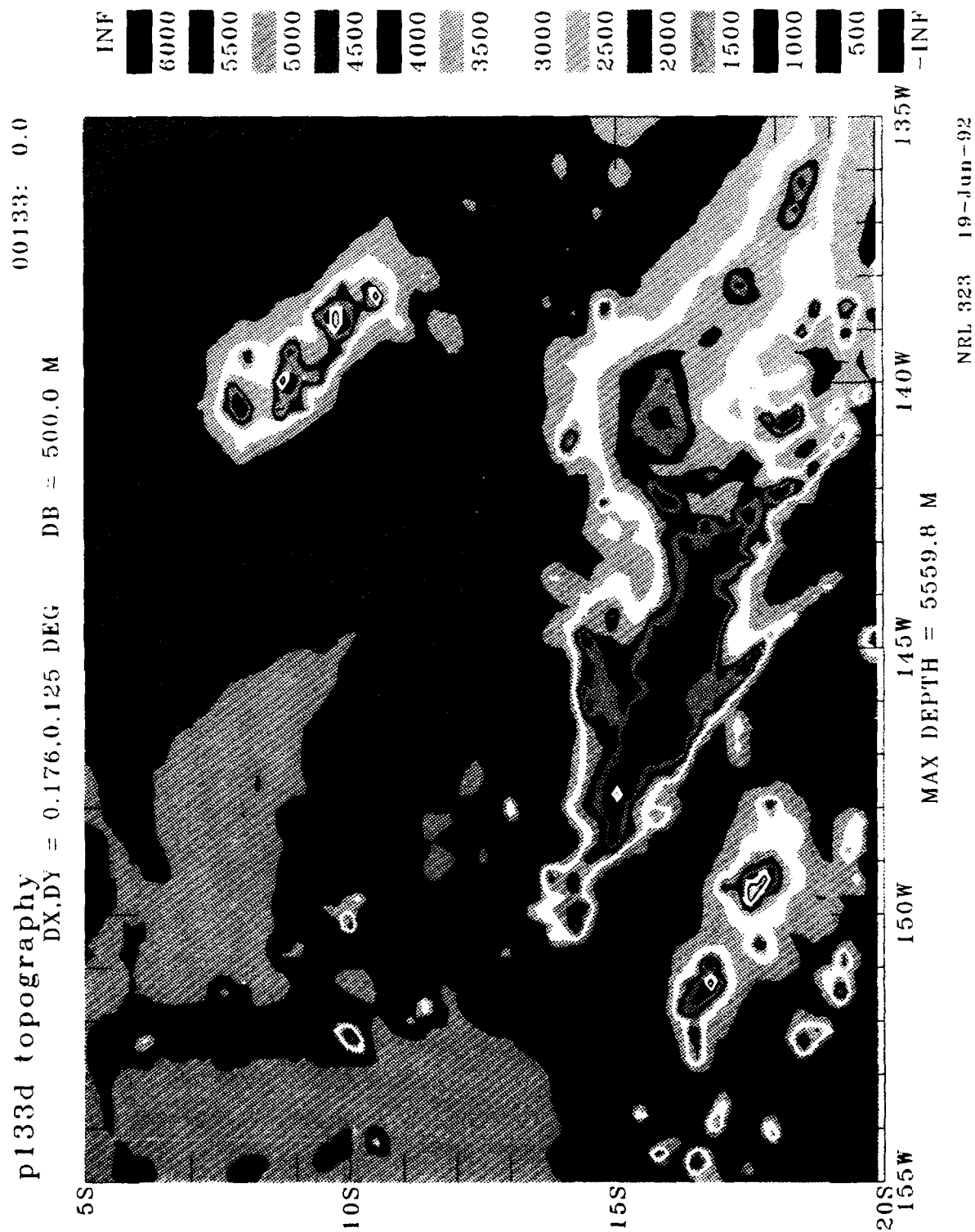


Figure 27: Plot of the Samoan Islands from the new $1/8^\circ$ Pacific topography.

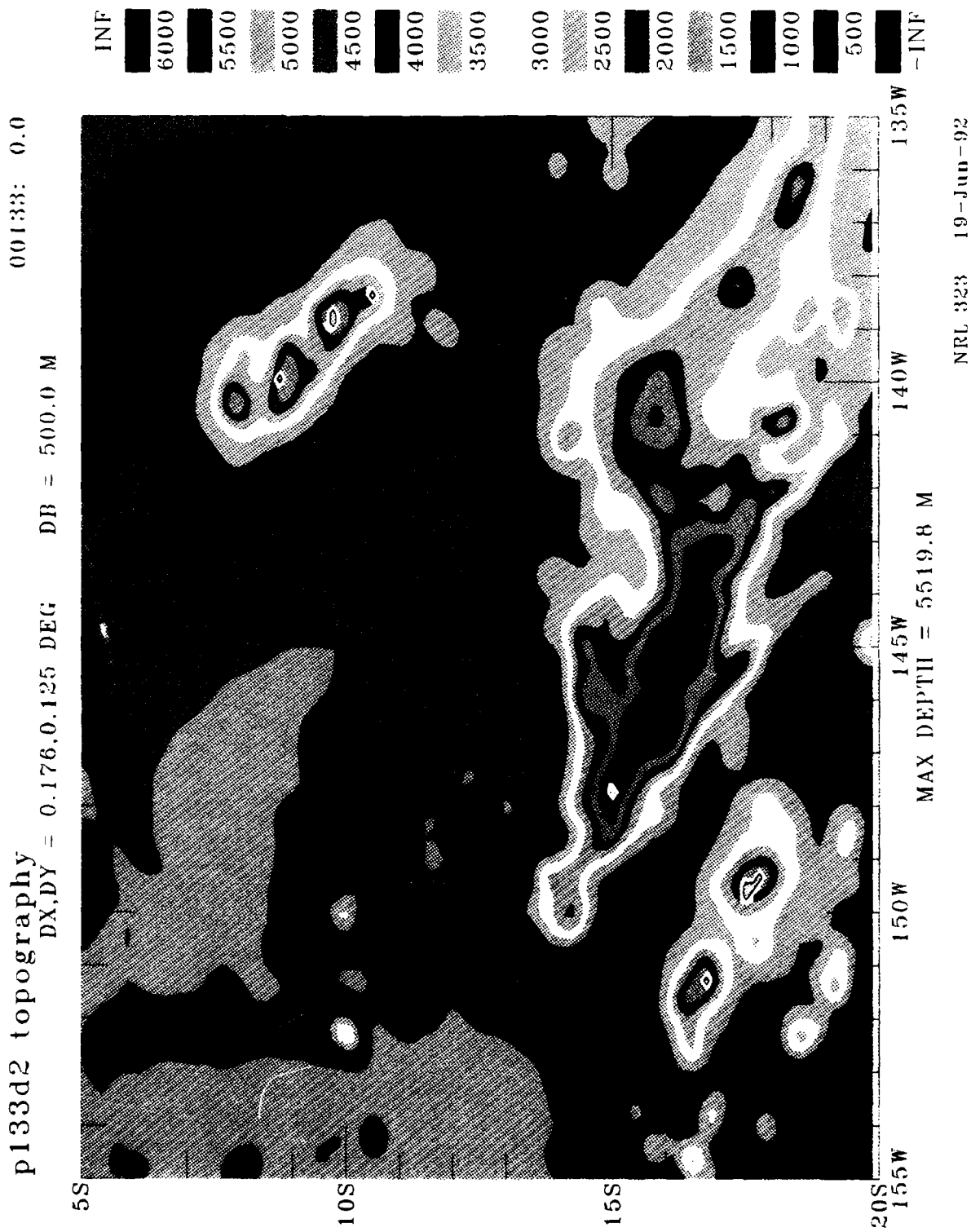


Figure 28: Plot of the Samoan Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

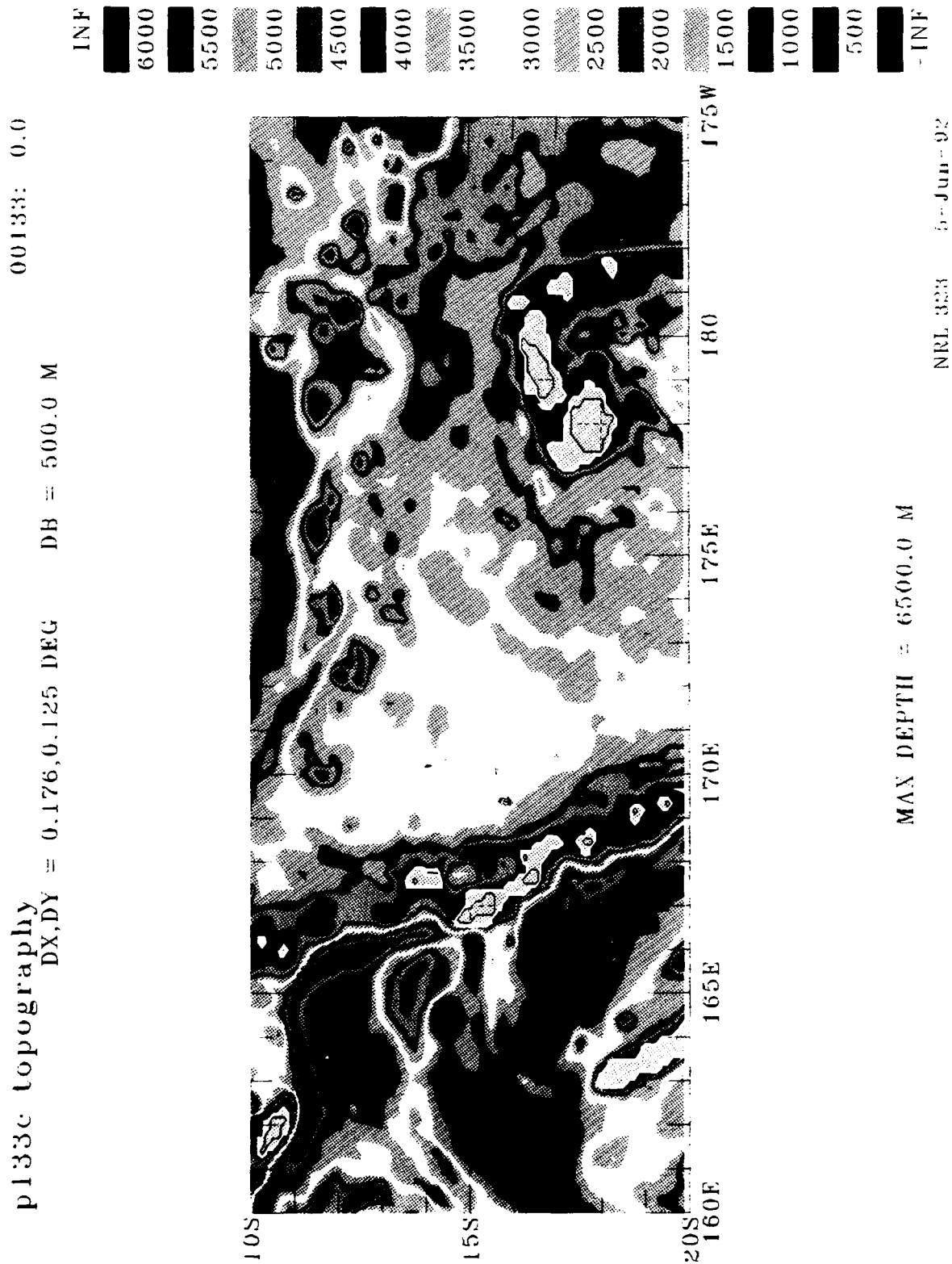


Figure 29: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the unmodified 1/8° Pacific topography.

ETOPO5 topography

00999: 0.0

DX,DY = 0.083,0.083 DEG DB = 500.0 M

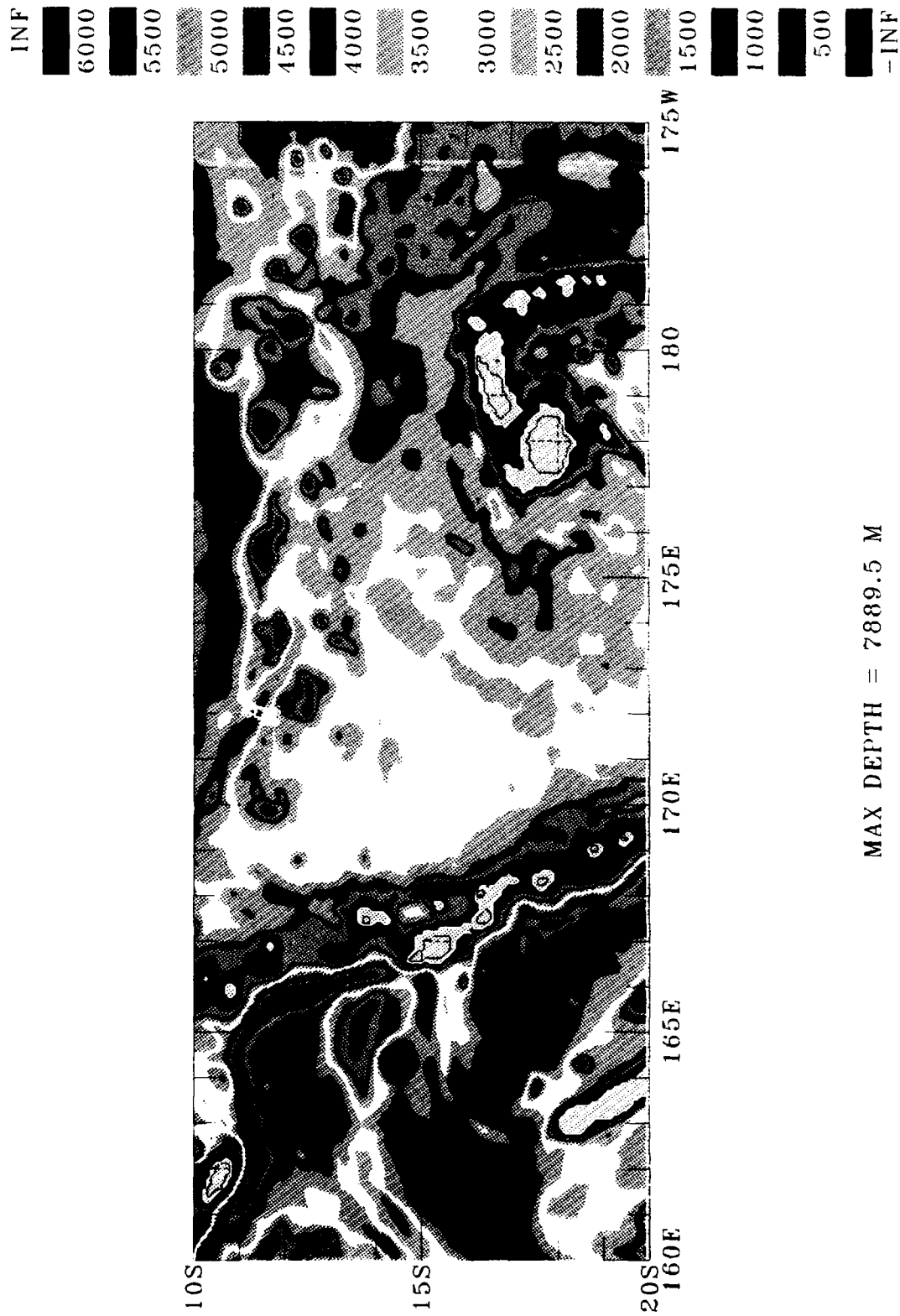


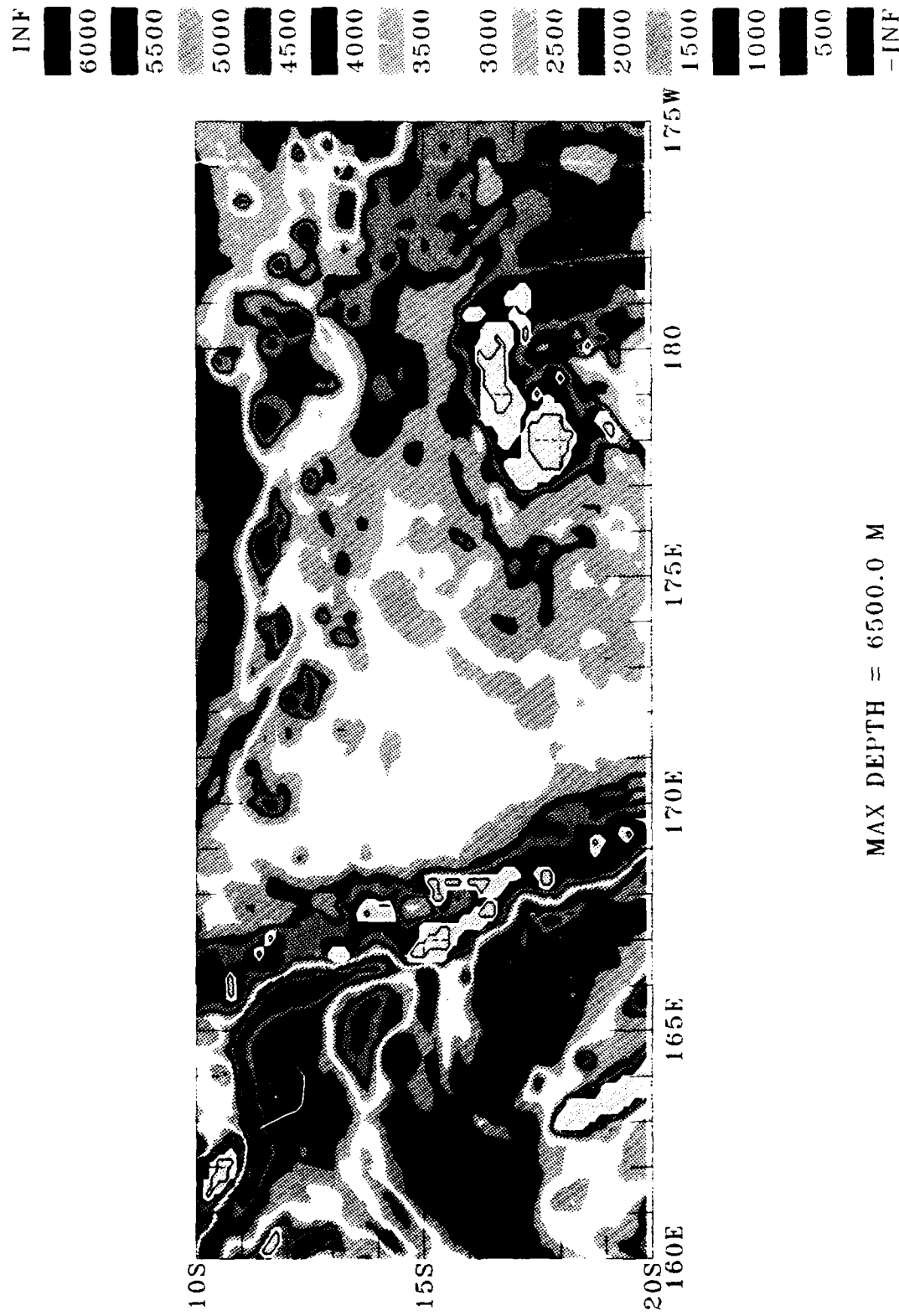
Figure 30: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the 1/12° ETOPO5 topography.

p133d topography

PX, PY = 0.176, 0.125 DEG

DB = 500.0 M

00133: 0.0



MAX DEPTH = 6500.0 M

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Figure 31: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the new 1/8° Pacific topography.

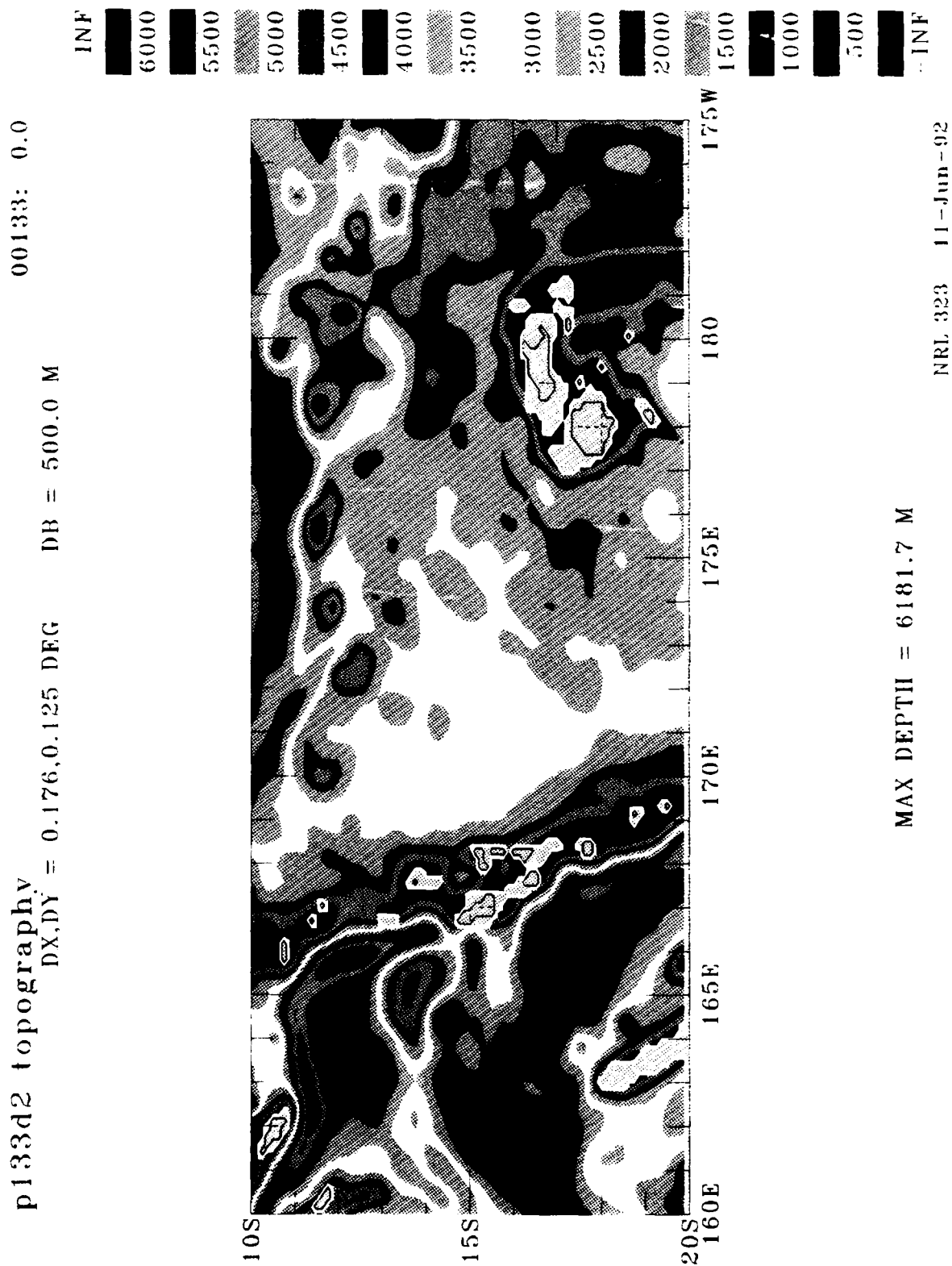


Figure 32: Plot of the New Caledonia, New Hebrides, and the Fiji Islands from the new 1/8° Pacific topography which has been smoothed by two passes of a 9-point smoother.

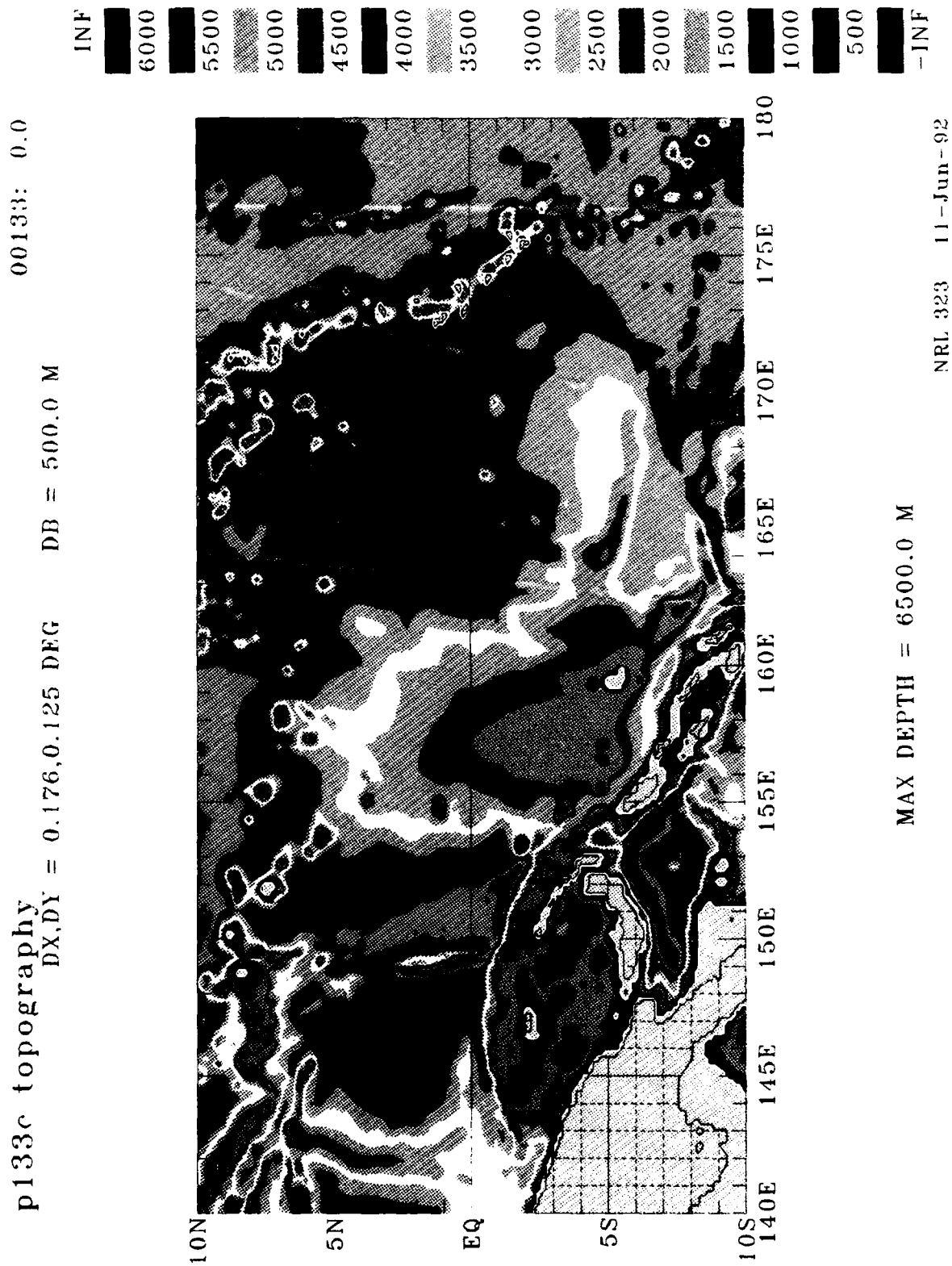


Figure 33: Plot of the TOGA/COARE region from the unmodified 1/8° Pacific topography.

ETOP05 topography

00999: 0.0

DX,DY = 0.083,0.083 DEG DB = 500.0 M

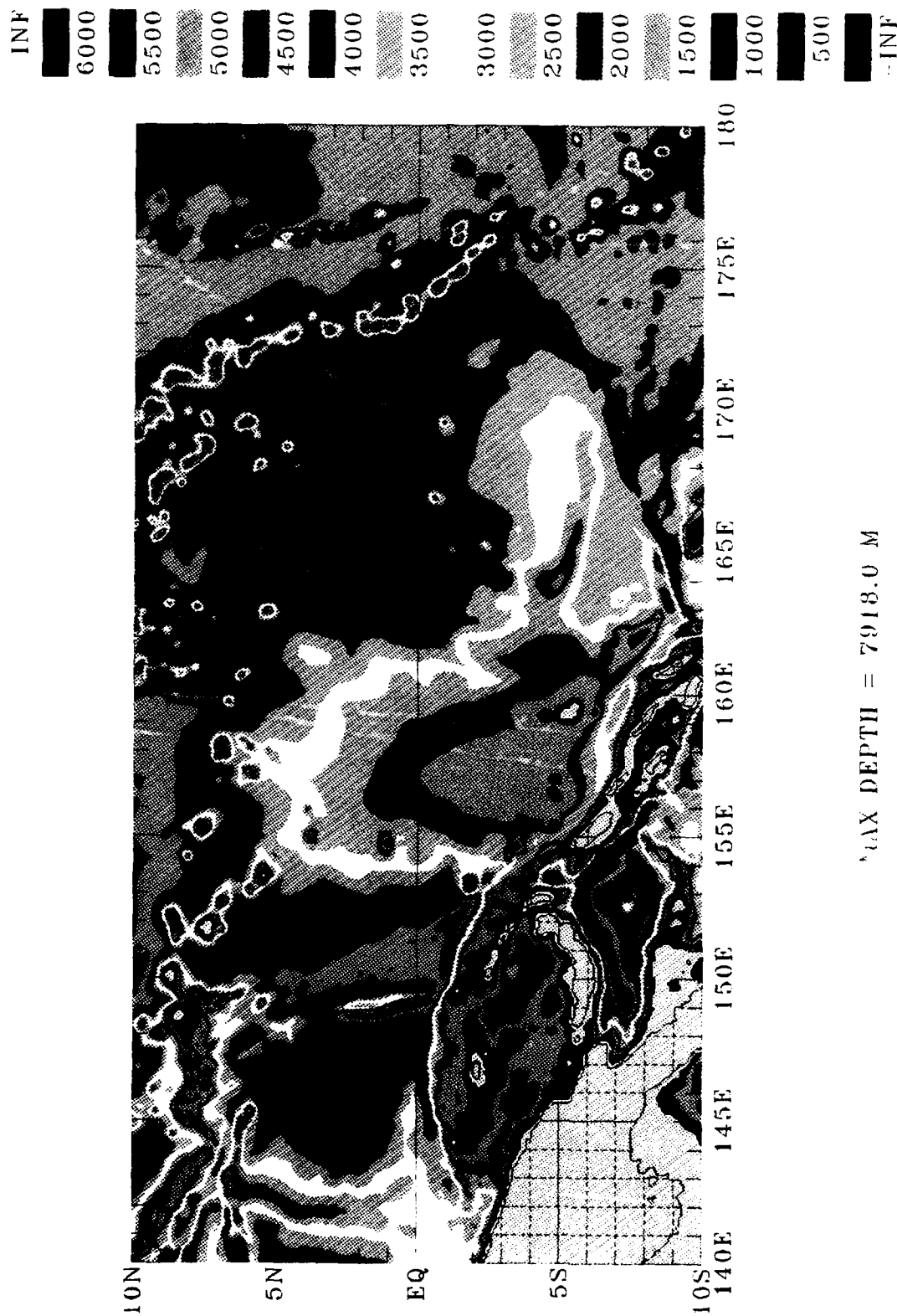


Figure 34: Plot of the TOGA/COARE region from the 1/12° ETOP05 topography.

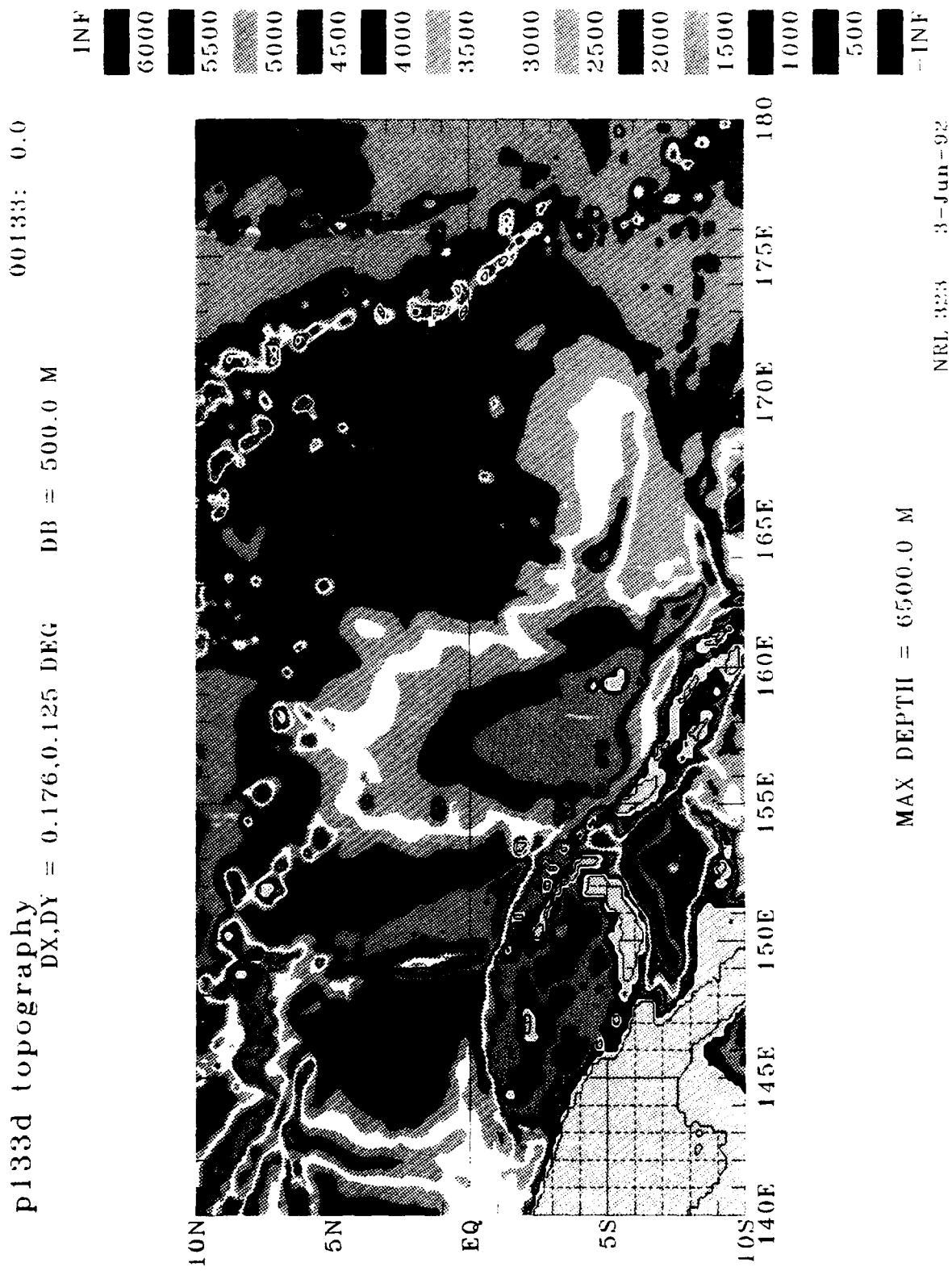


Figure 35: Plot of the TOGA/COARE region from the new 1/8° Pacific topography.

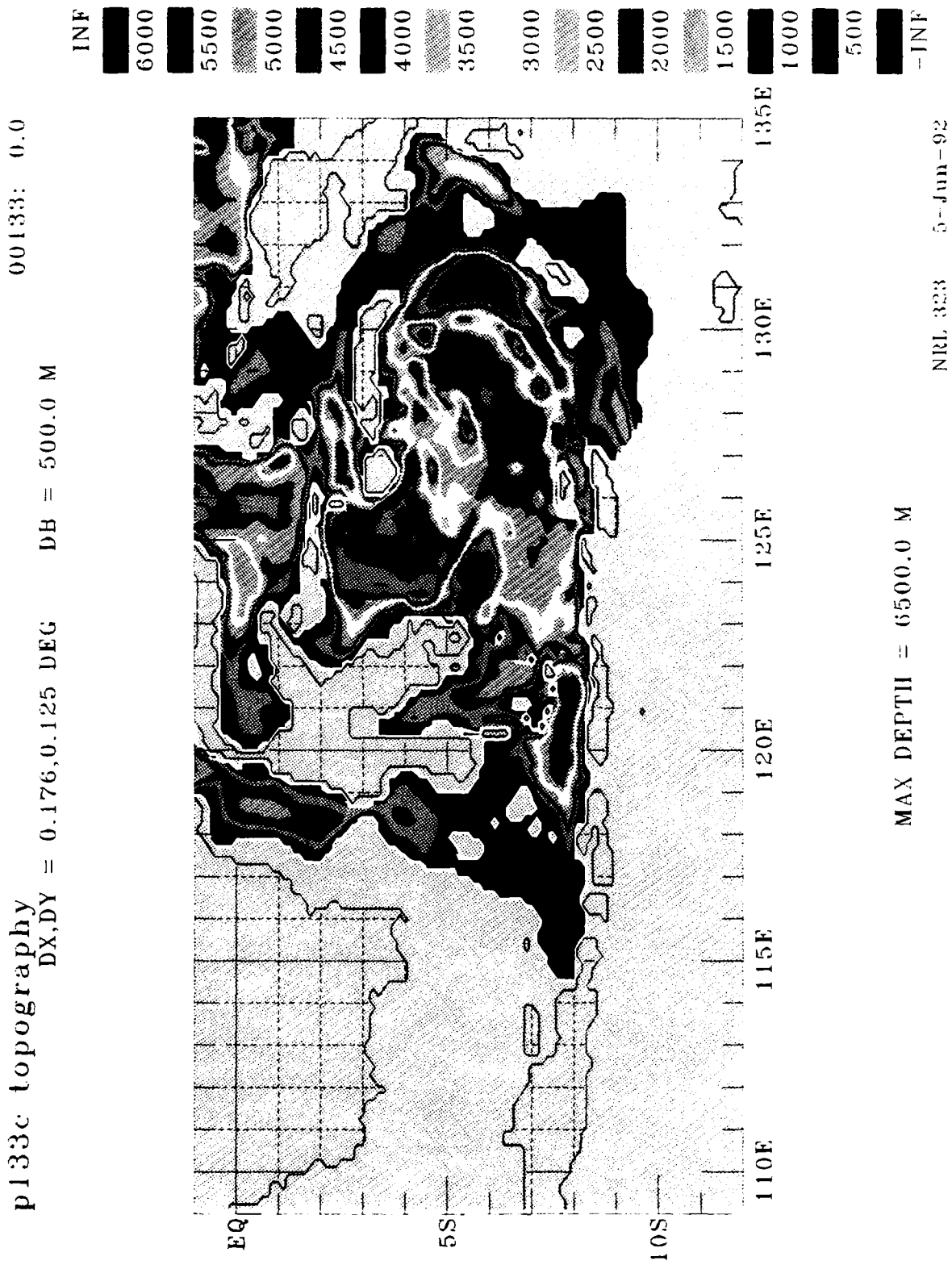


Figure 37: Plot of the Indonesian Throughflow region from the unmodified 1/8° Pacific topography.

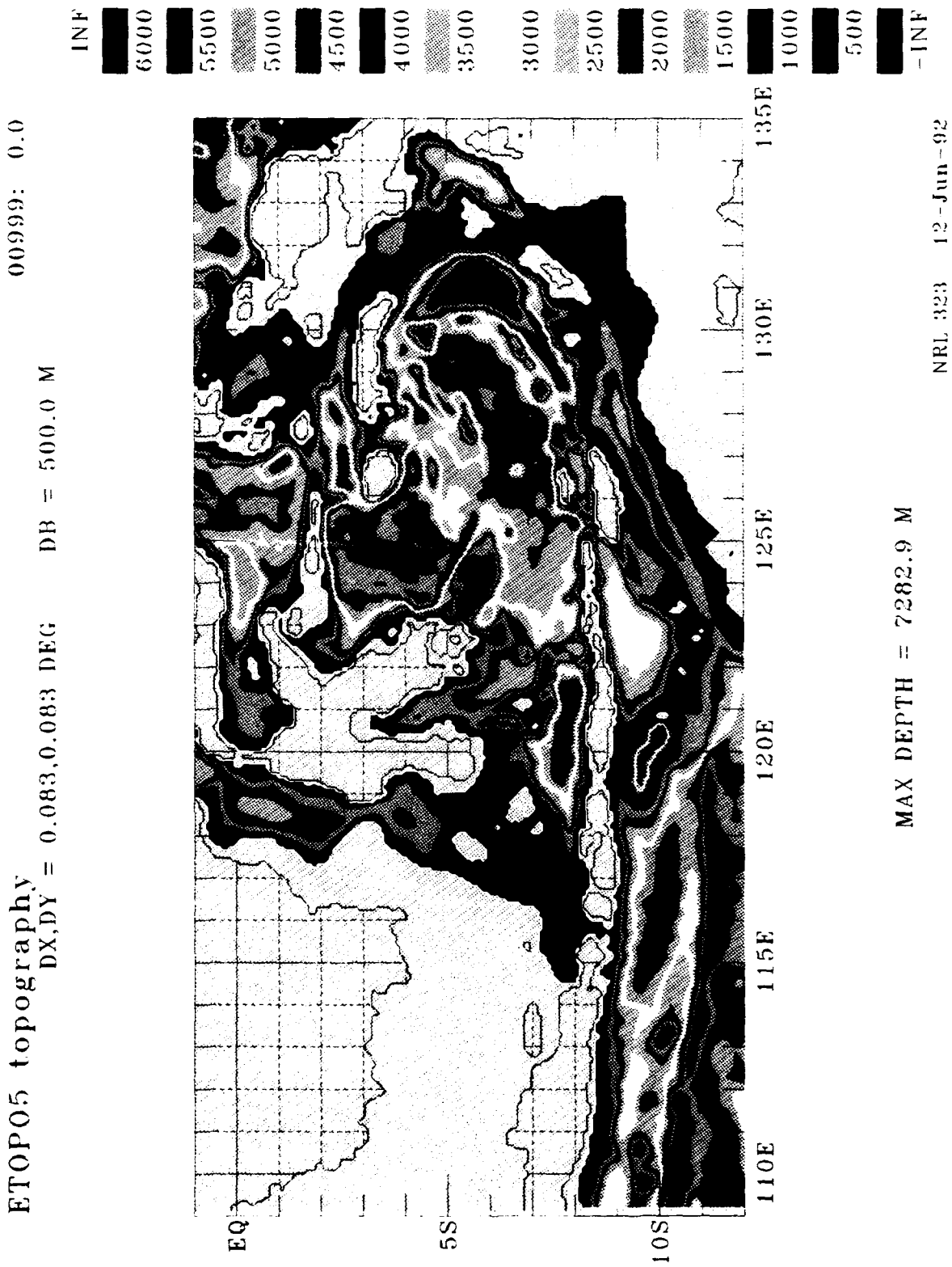


Figure 38: Plot of the Indonesian Throughflow region from the 1/12° ETOPO5 topography.

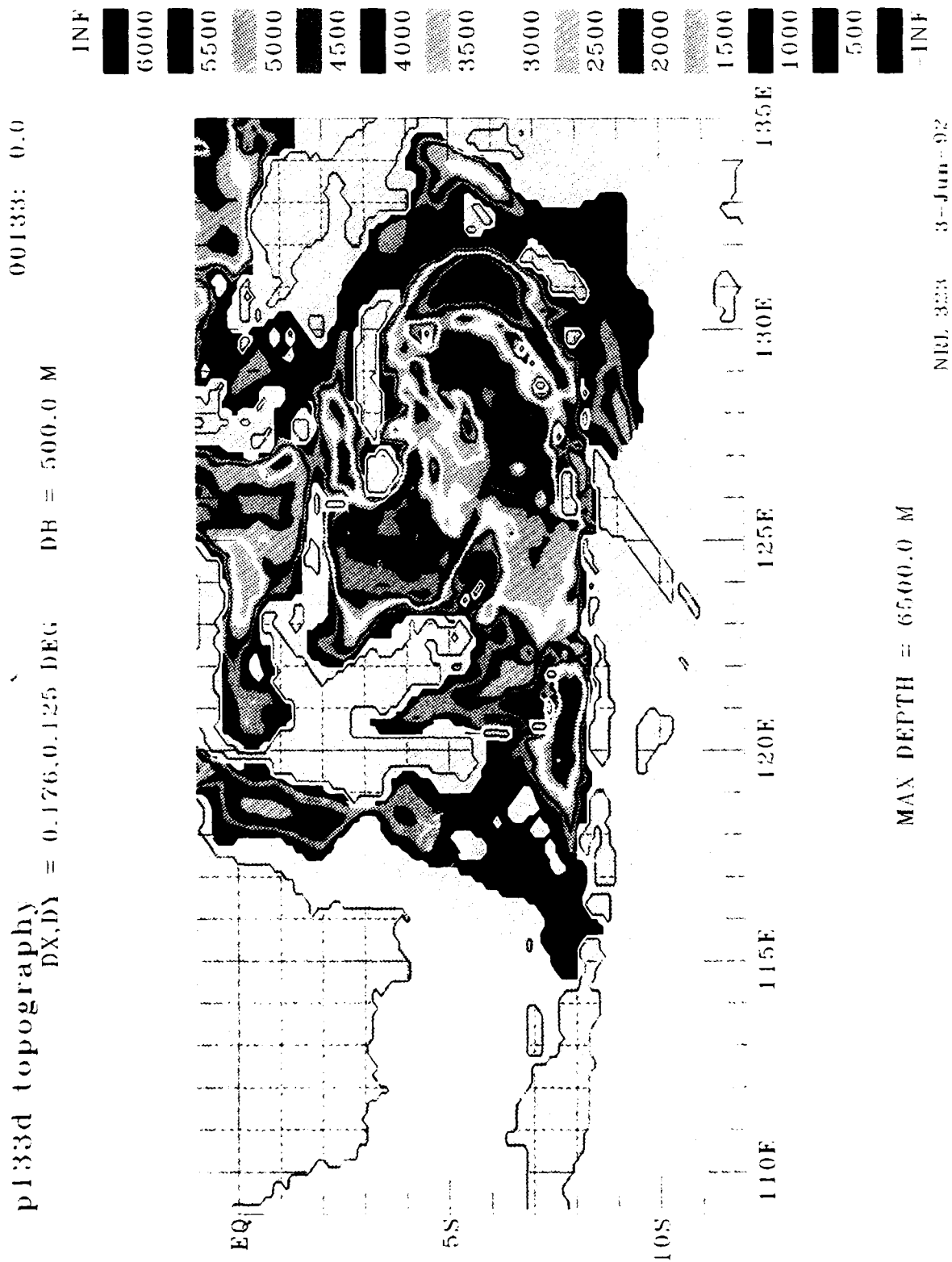


Figure 39: Plot of the Indonesian Throughflow region from the new 1/8° Pacific topography.

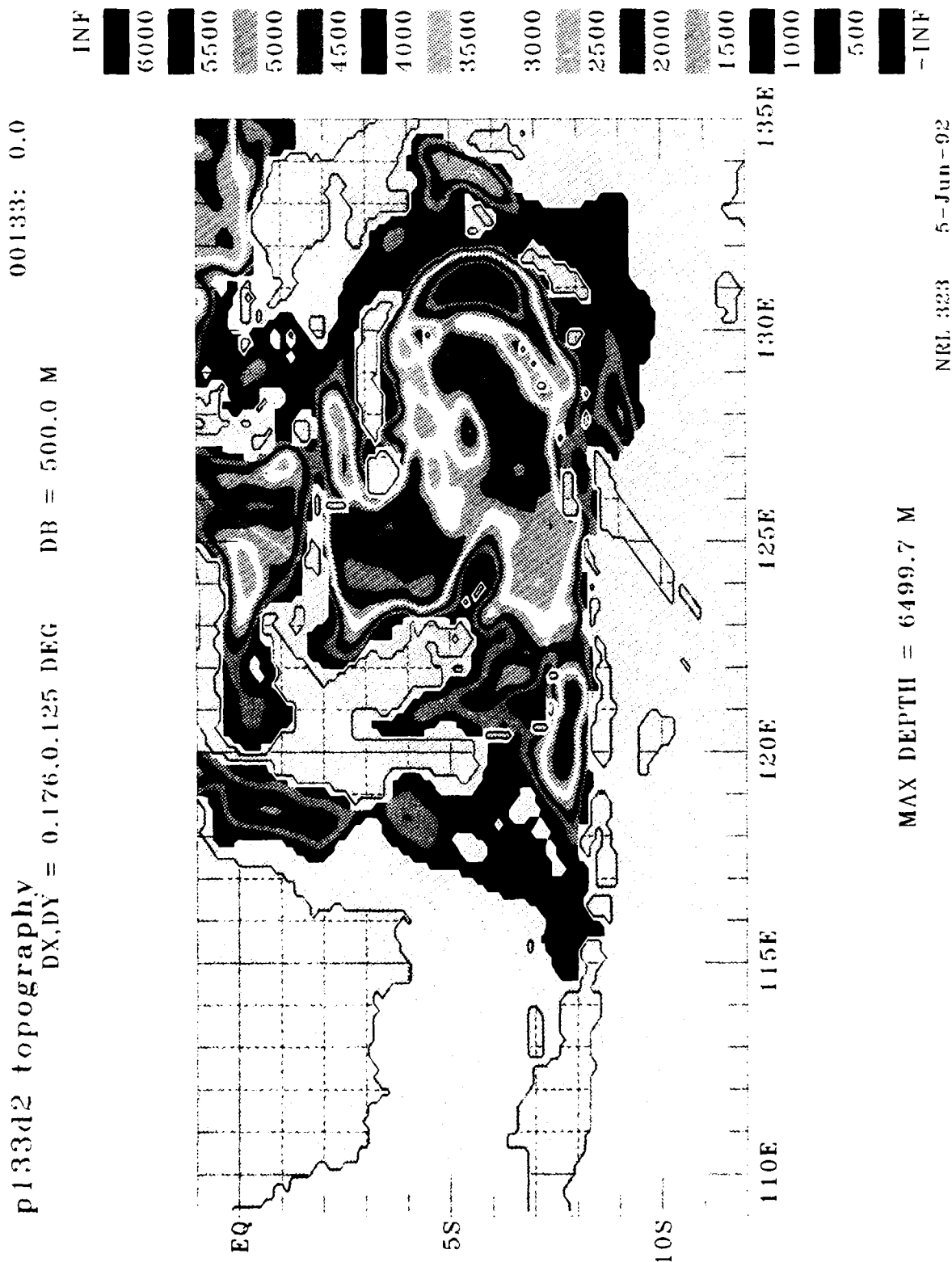


Figure 40: Plot of the Indonesian Throughflow region from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

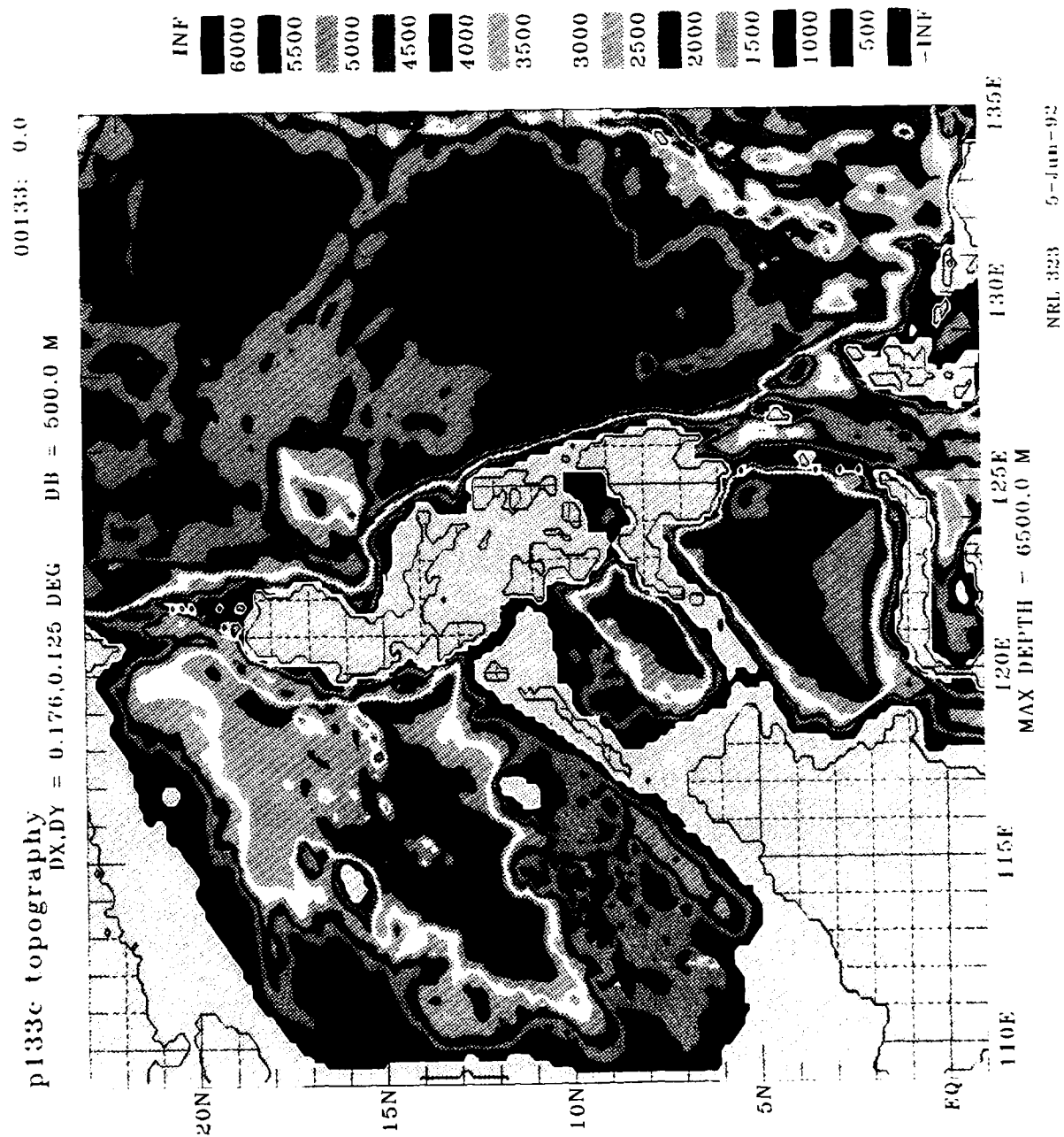


Figure 41: Plot of the Philippine Islands and the S China Sea from the unmodified 1/8° Pacific topography.

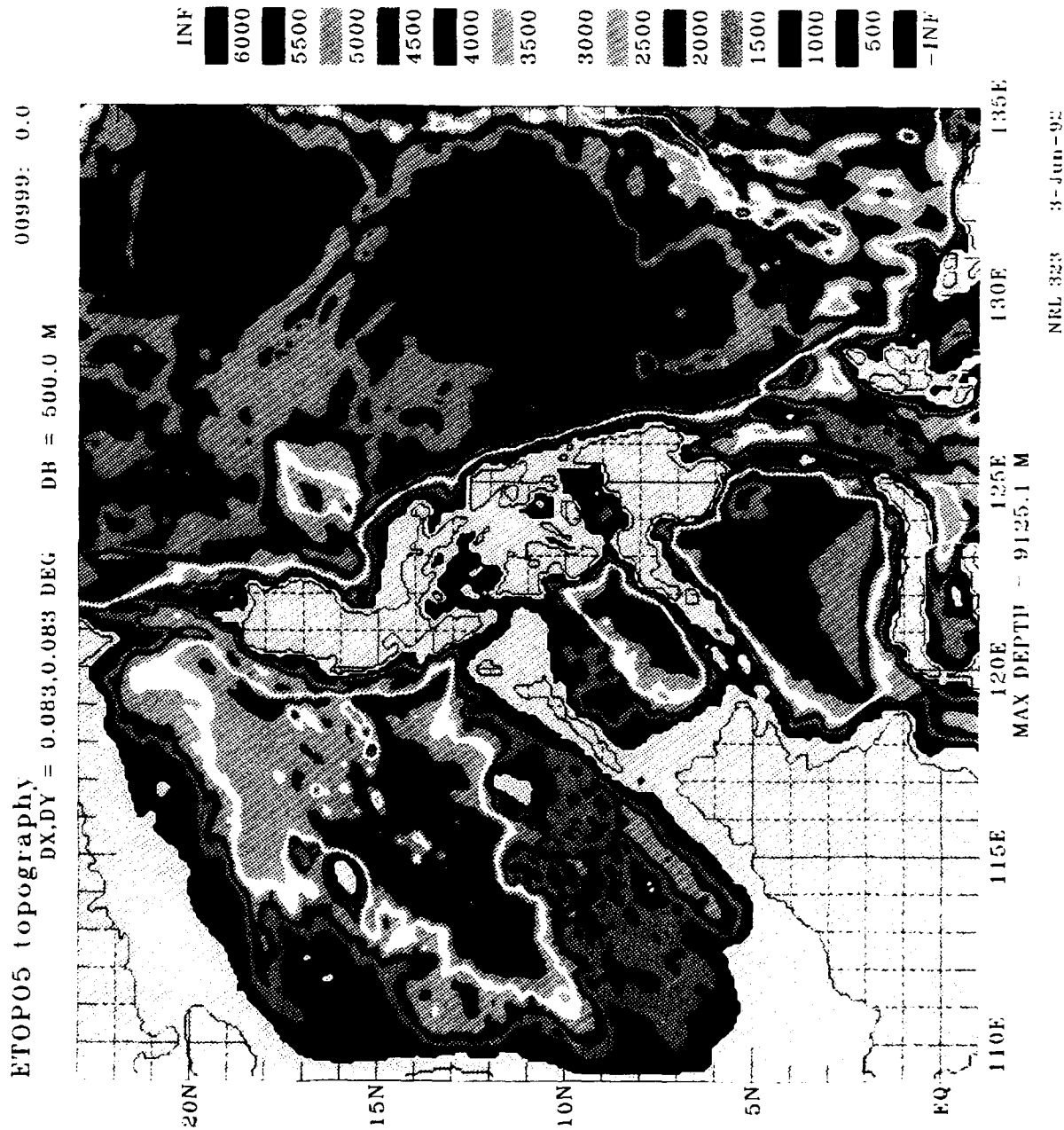


Figure 42: Plot of the Philippine Islands and the S China Sea from the 1/12° ETOP05 topography.

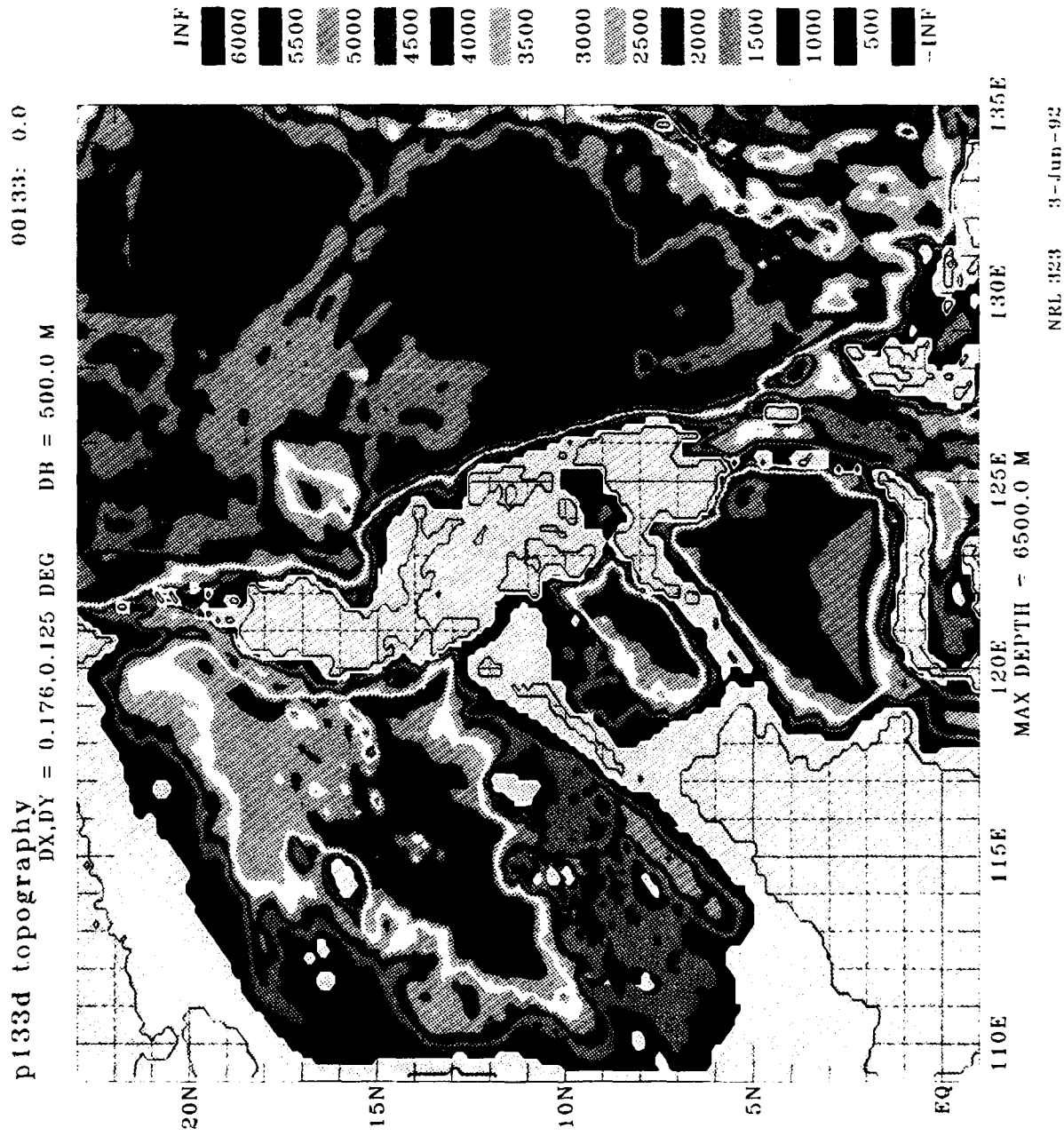
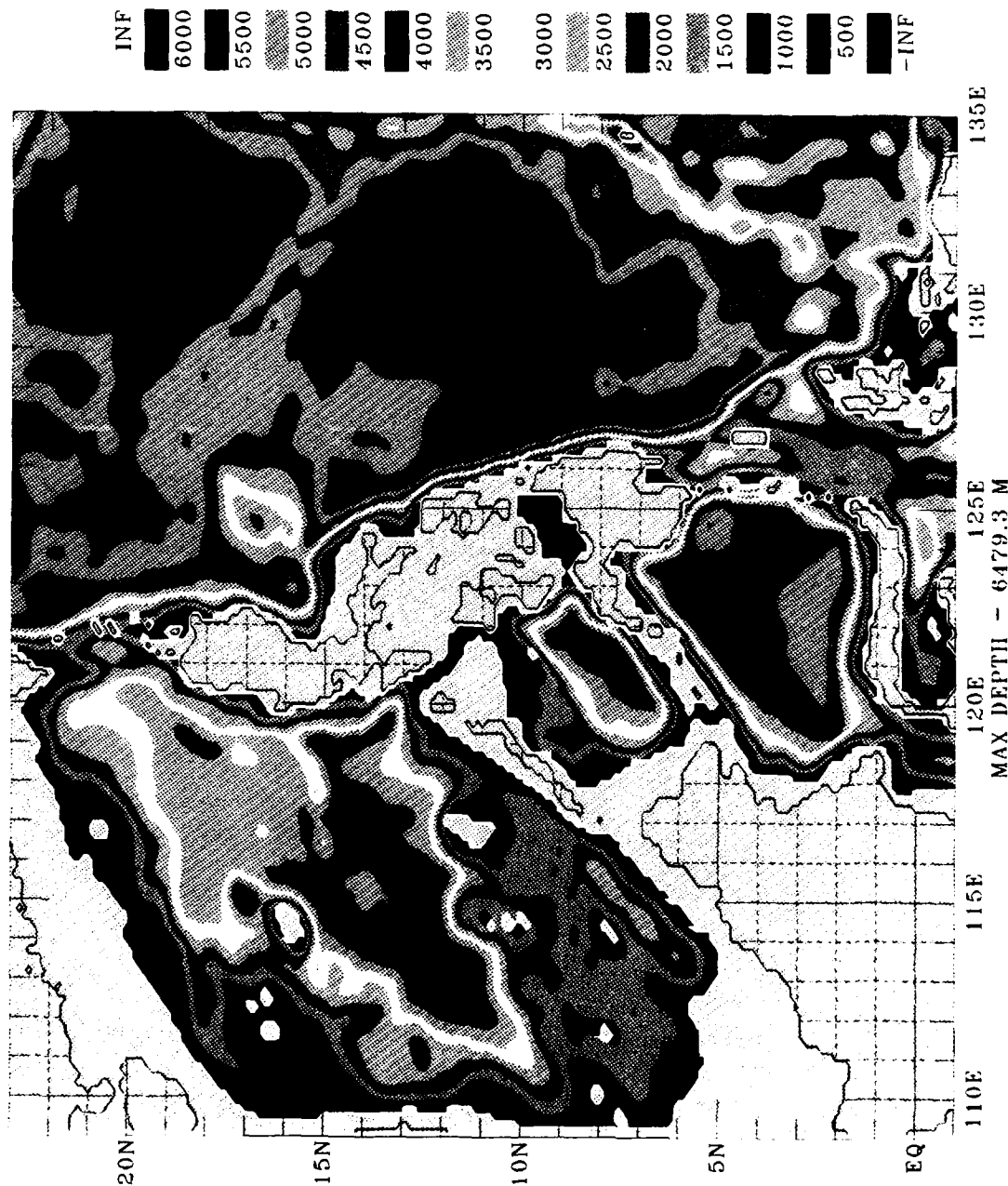


Figure 43: Plot of the Philippine Islands and the S China Sea from the new 1/8° Pacific topography.

p133d2 topography

DX,DY = 0.176,0.125 DEG DB = 500.0 M

00133: 0.0



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Figure 44: Plot of the Philippine Islands and the S China Sea from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

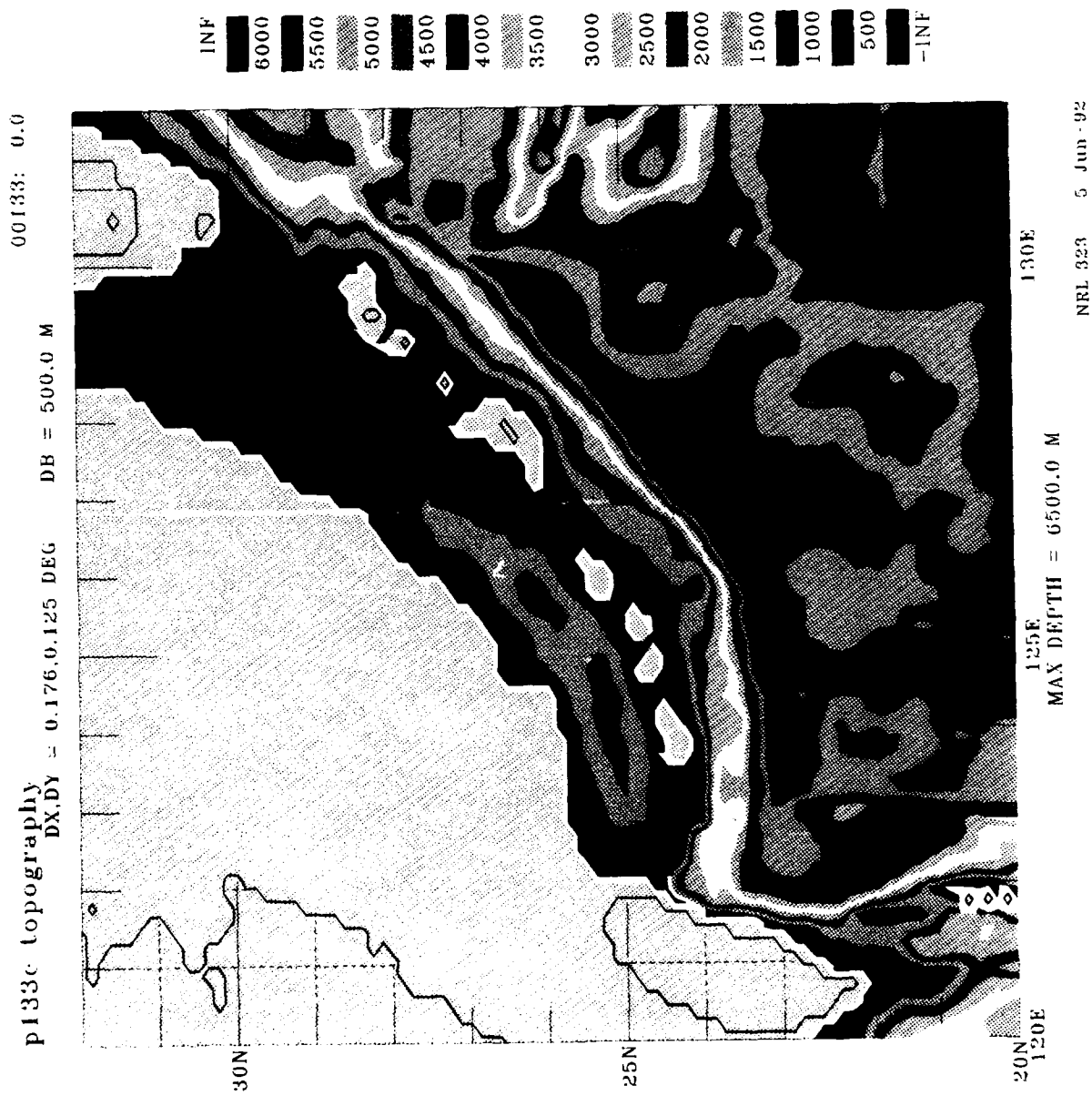


Figure 45: Plot of the E China Sea from the unmodified 1/8° Pacific topography.

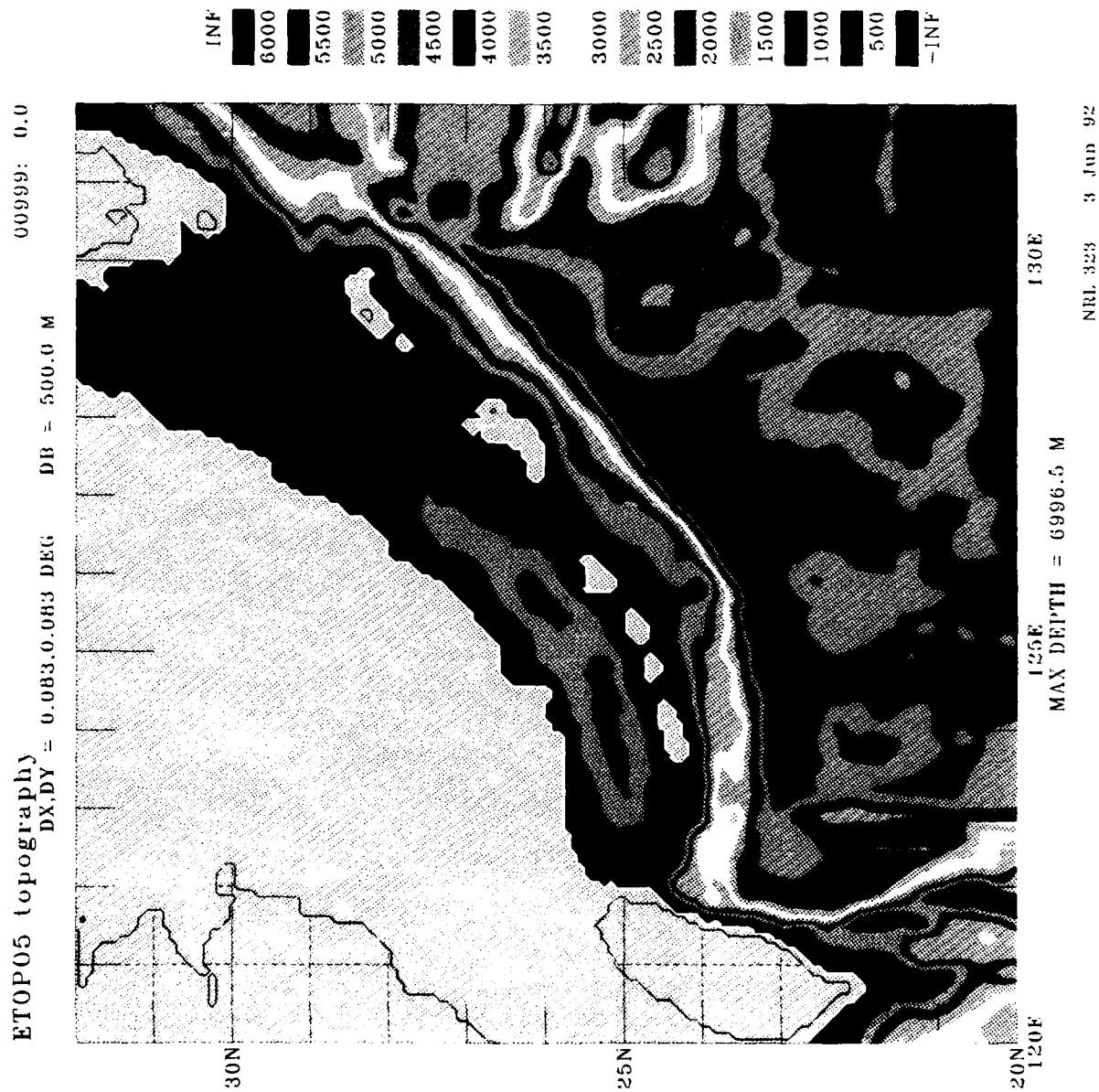


Figure 46: Plot of the E China Sea from the 1/12° ETOPO5 topography.

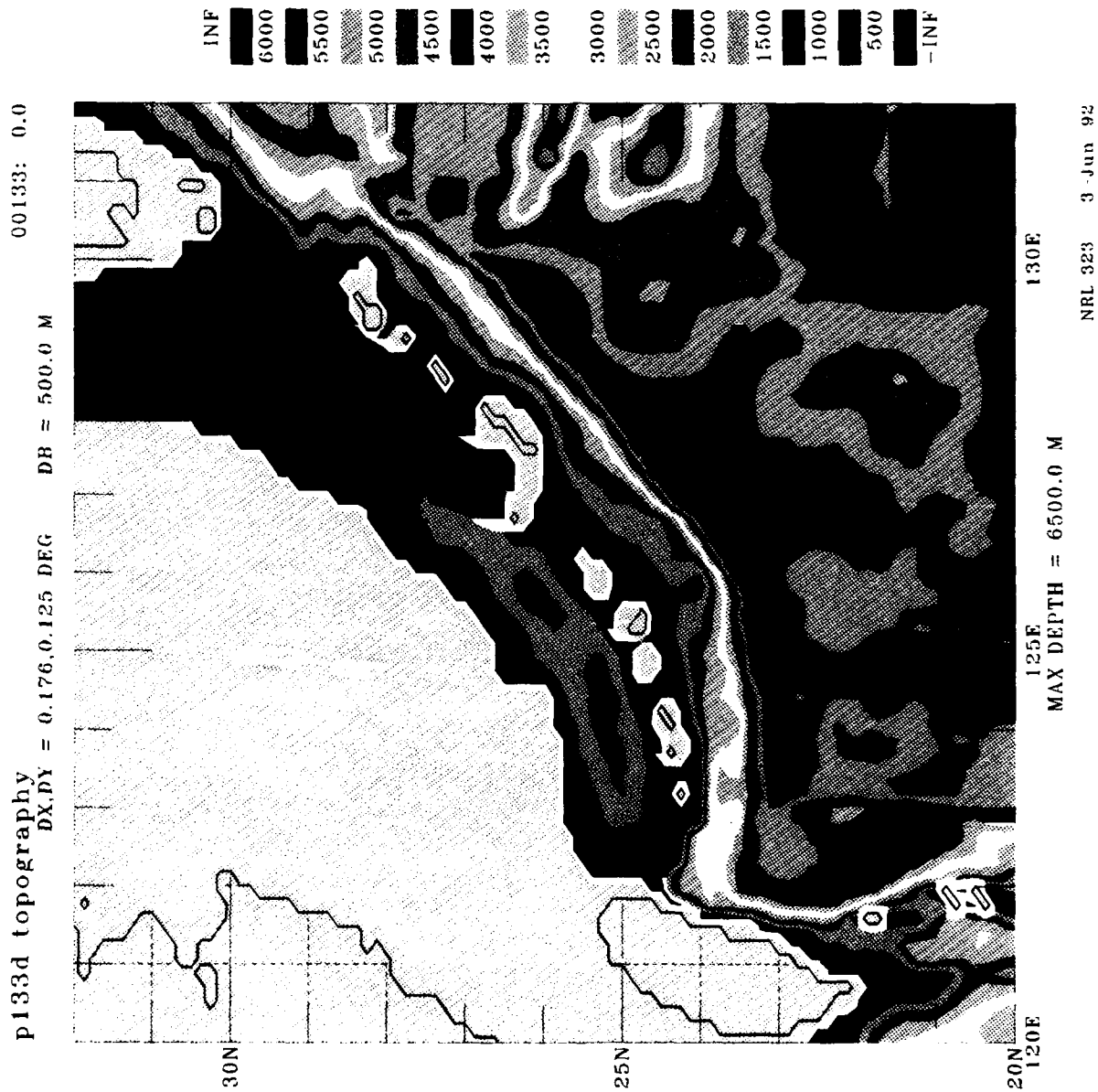


Figure 47: Plot of the E China Sea from the new 1/8° Pacific topography.

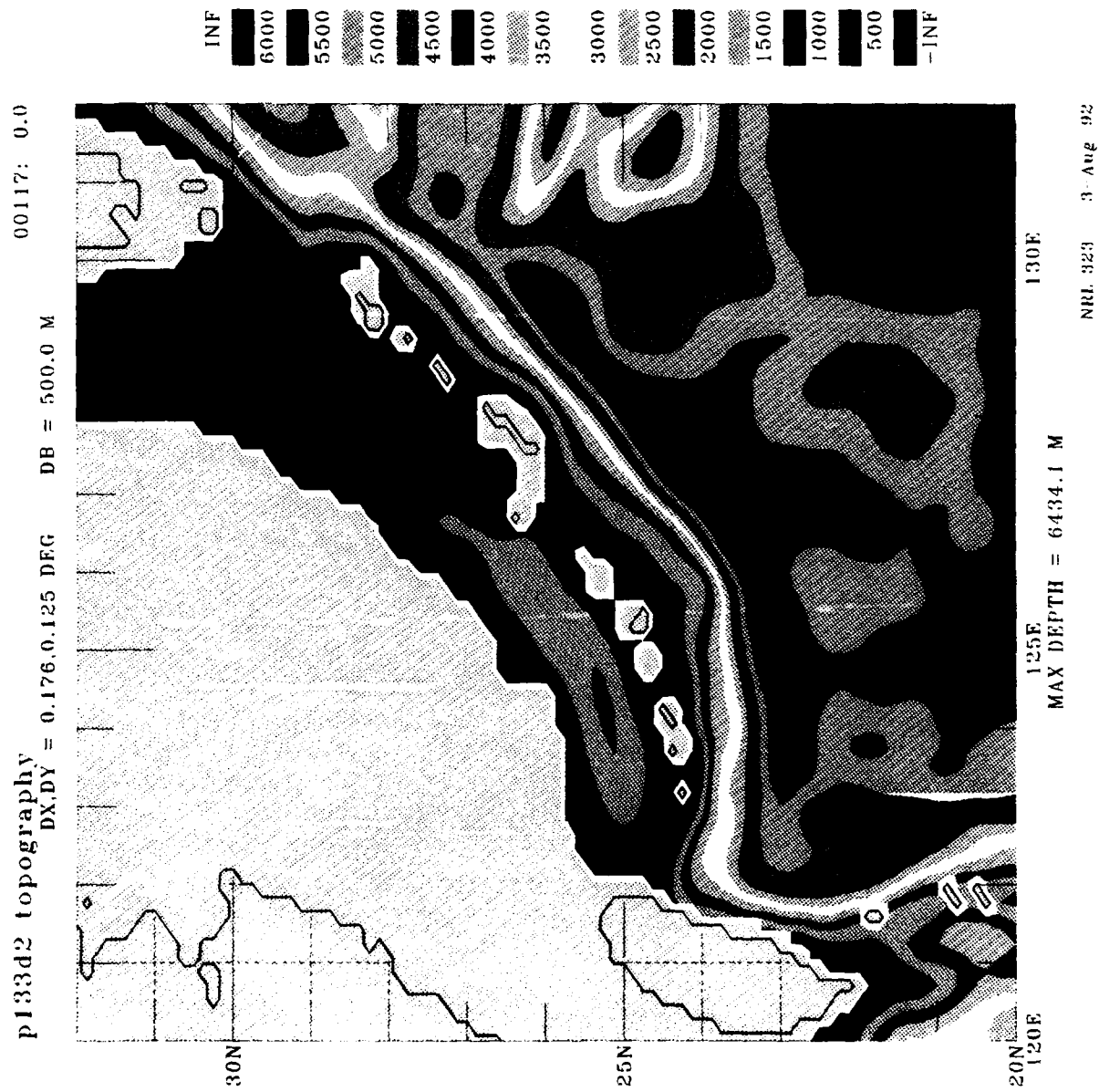


Figure 48: Plot of the E China Sea from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

P133c topography

DX,DY = 0.176,0.125 DEG

DB = 500.0 M

00133: 0.0



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Figure 49: Plot of the Mariana Islands from the unmodified 1/8° Pacific topography.

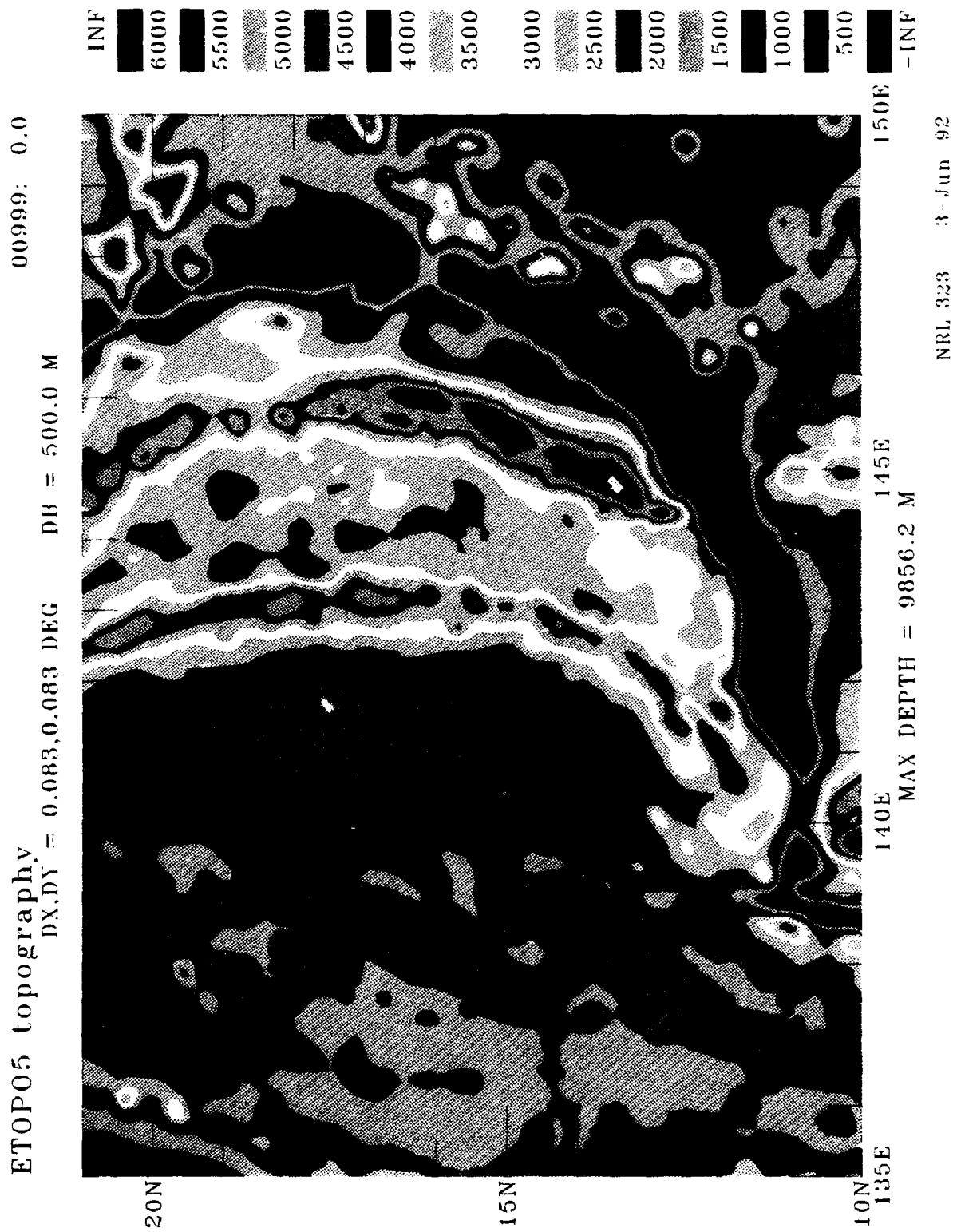


Figure 50: Plot of the Mariana Islands from the 1/12° ETOPO5 topography.

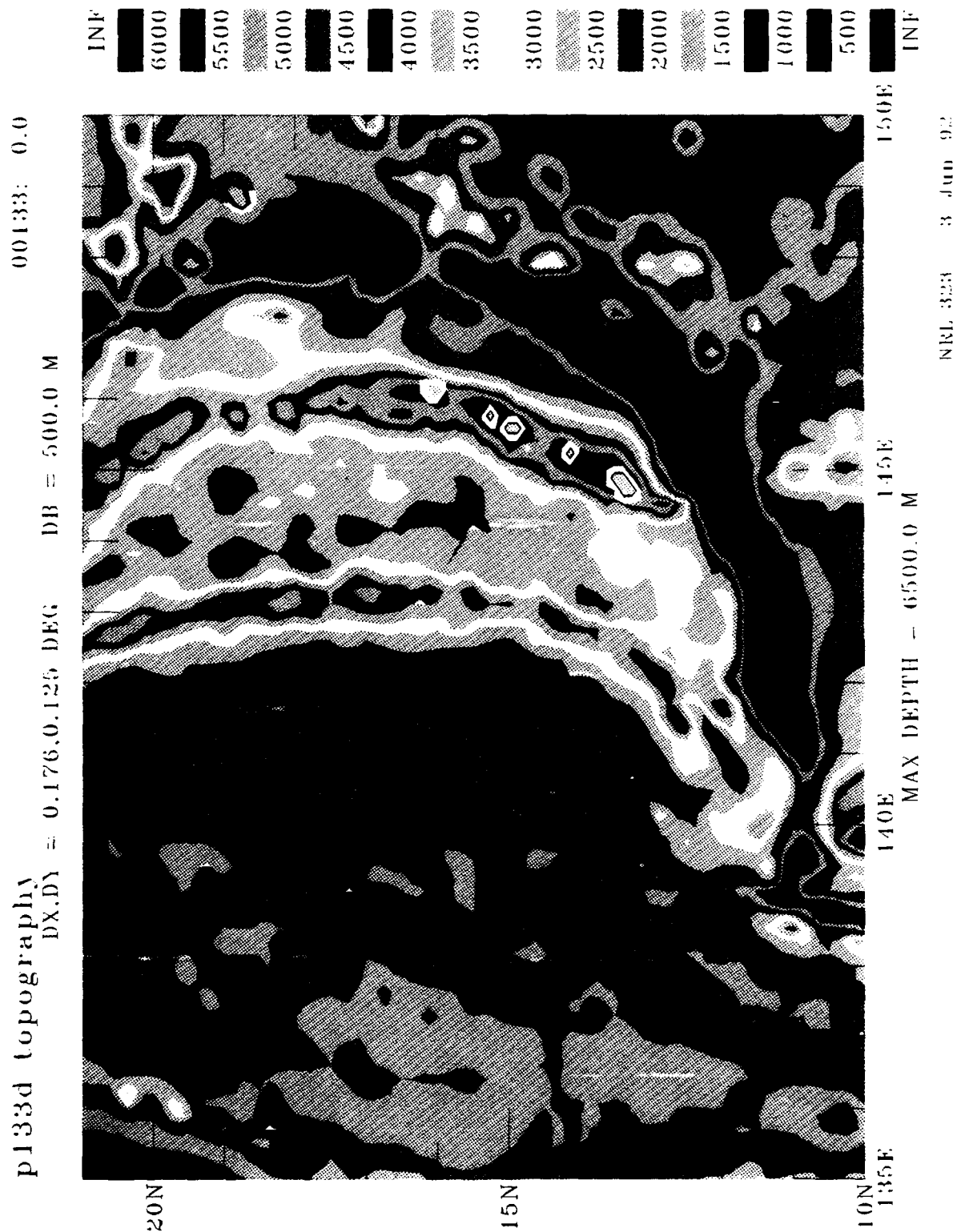


Figure 51: Plot of the Mariana Islands from the new 1/8° Pacific topography.

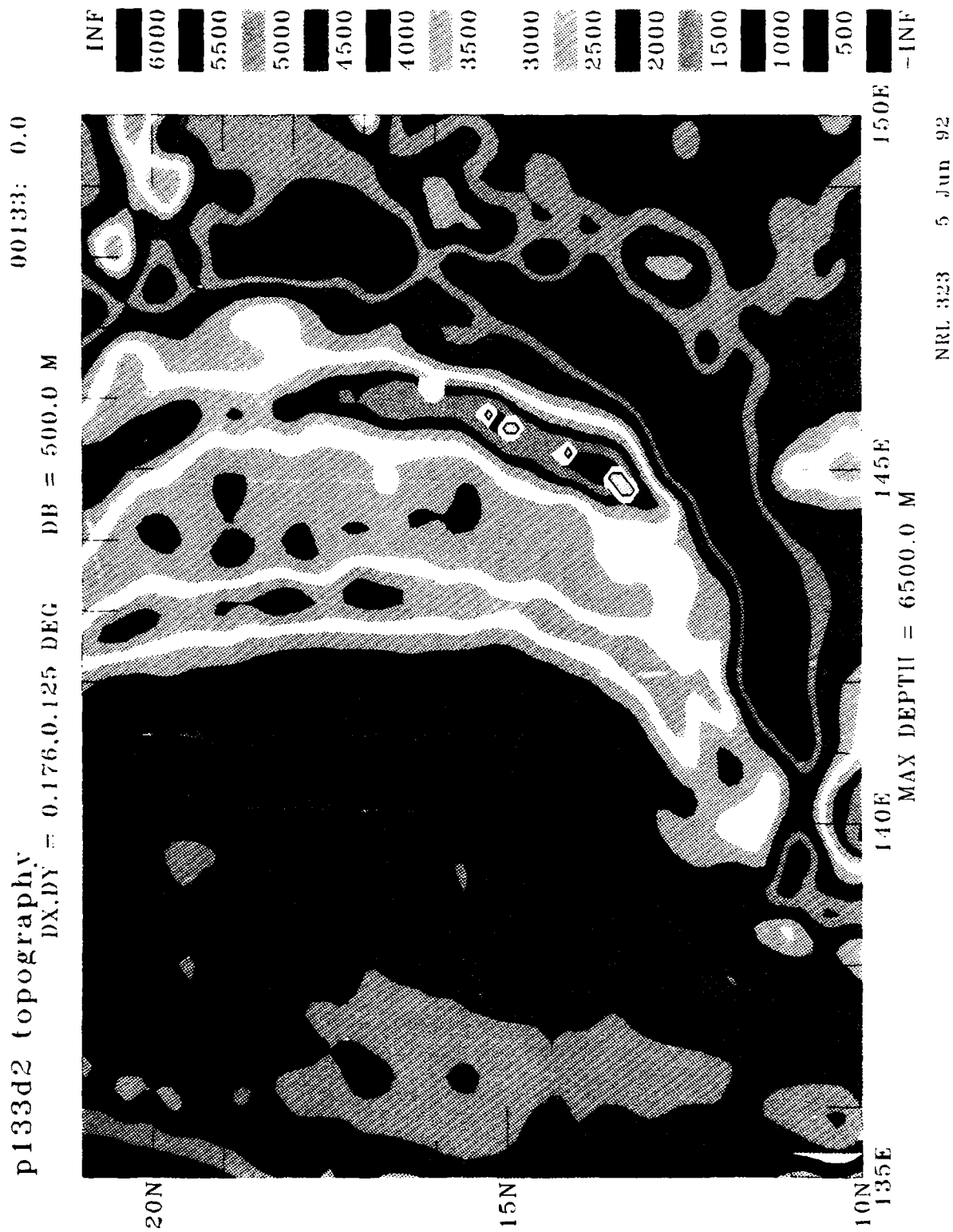


Figure 52: Plot of the Mariana Islands from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

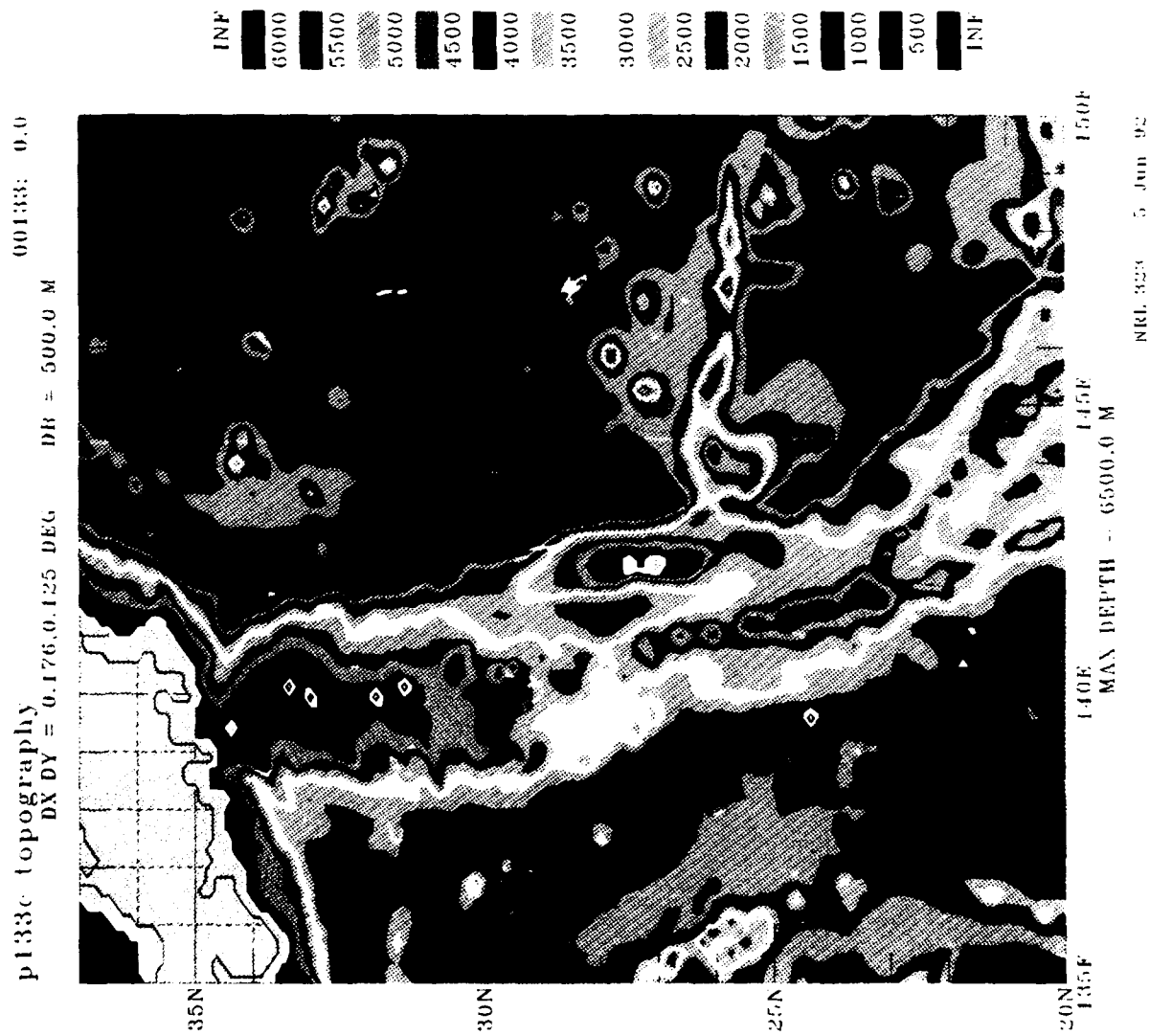


Figure 53: Plot of the Izu Ridge from the unmodified 1/8° Pacific topography.

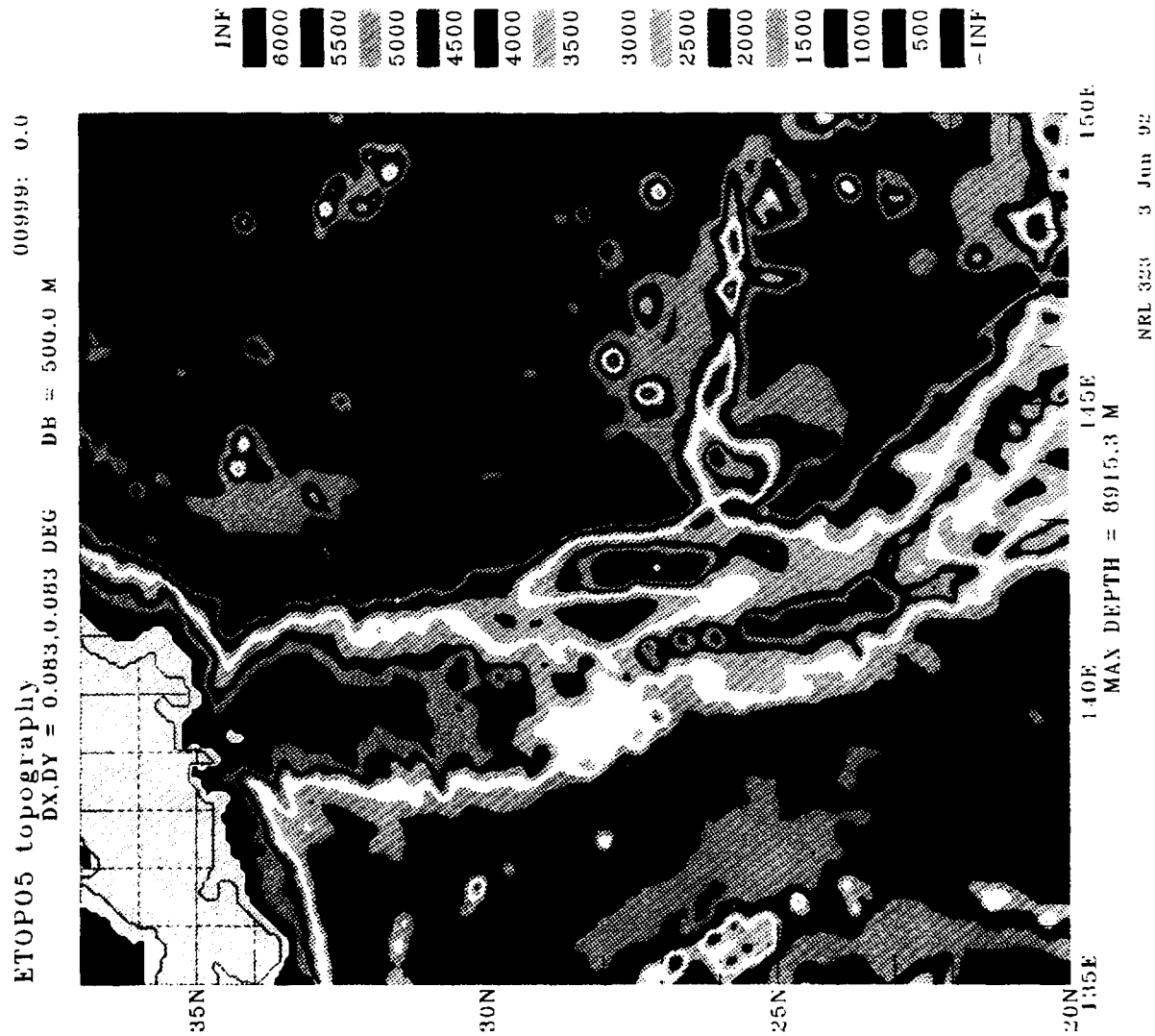


Figure 54: Plot of the Izu Ridge from the 1/12° ETOP05 topography.

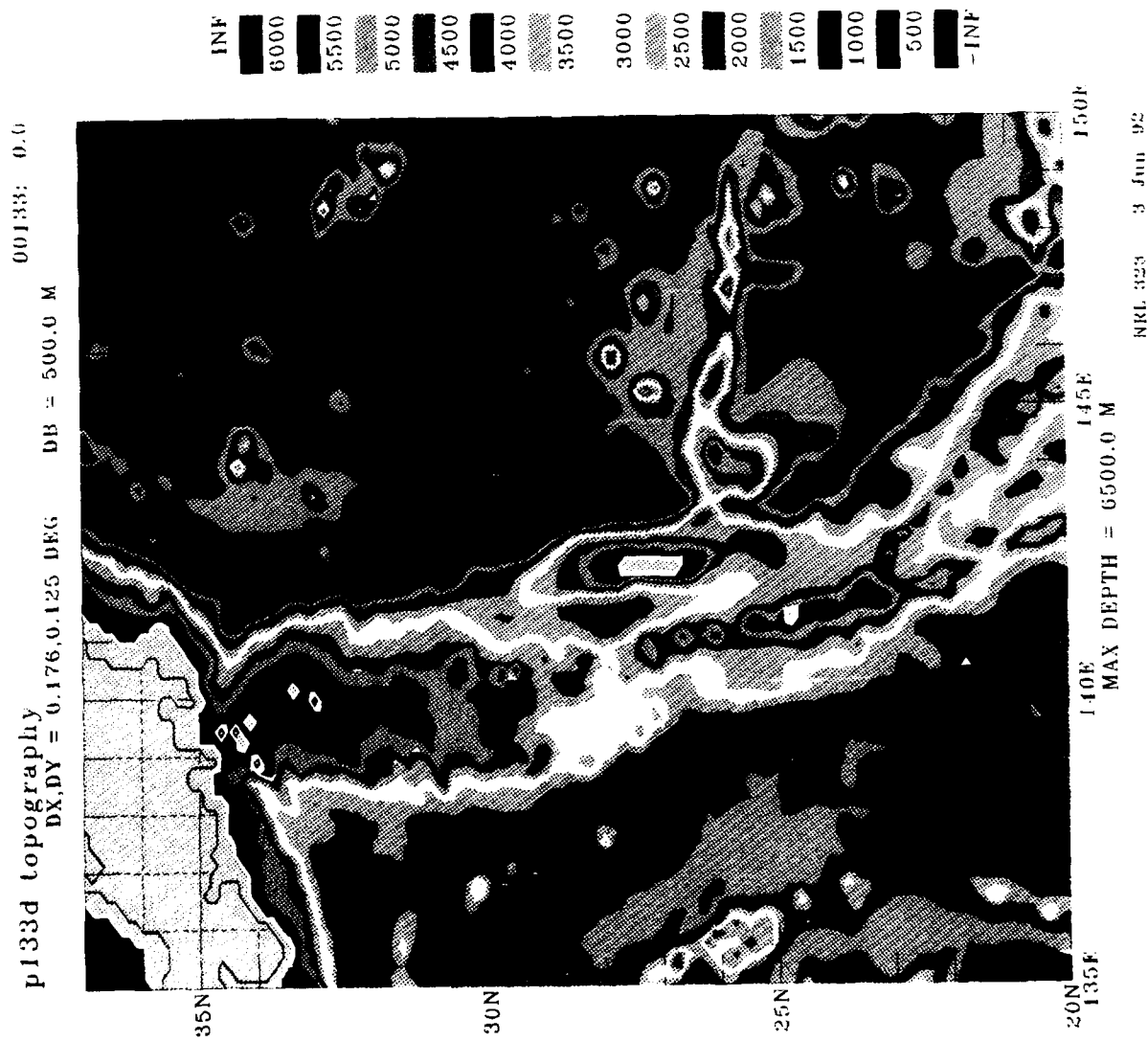


Figure 55: Plot of the Izu Ridge from the new $1/8^\circ$ Pacific topography.

p133d2 topography
 DX,DY = 0.176,0.125 DEG DB = 500.0 M 00117: 0.0

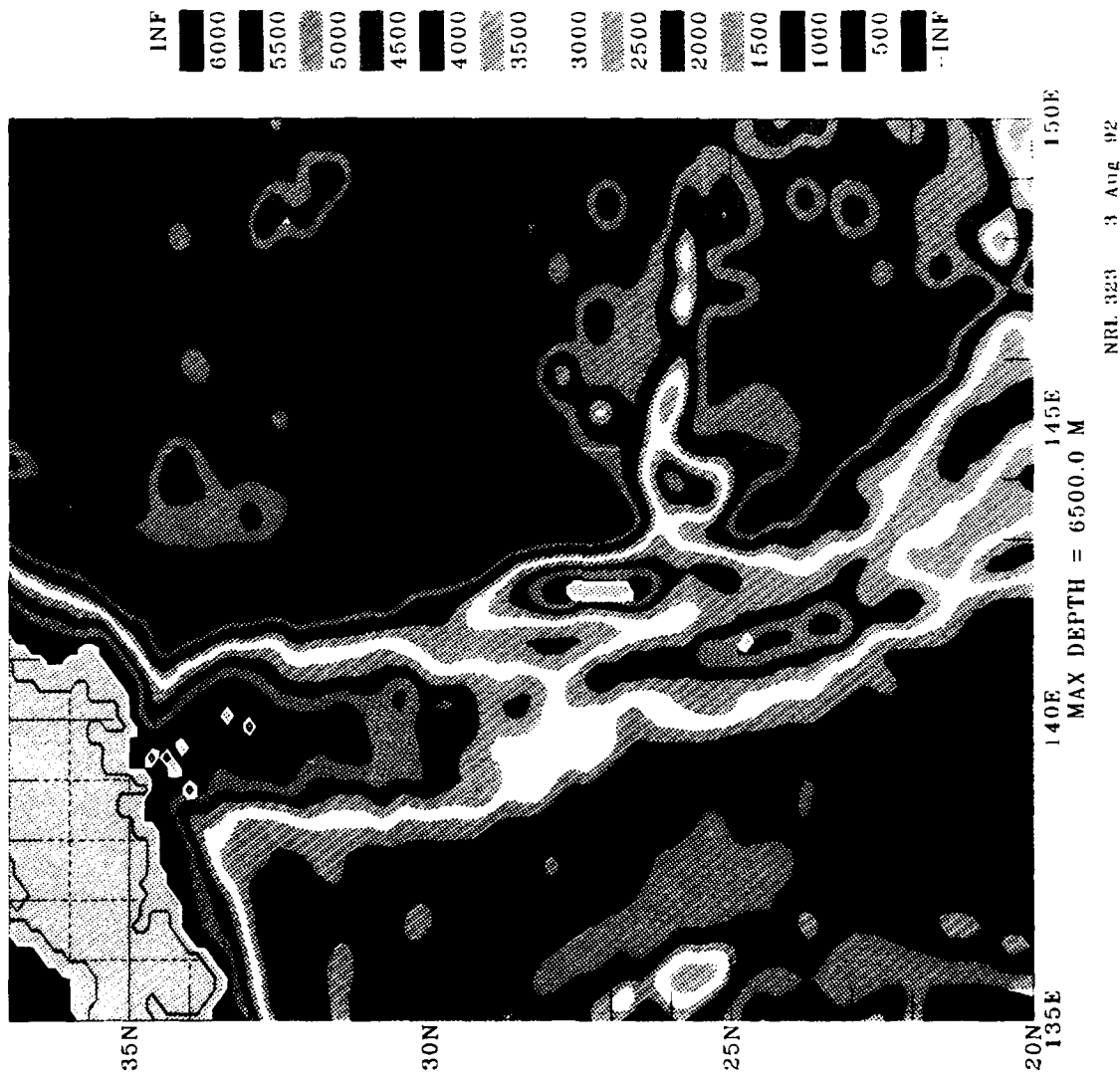


Figure 56: Plot of the Izu Ridge from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

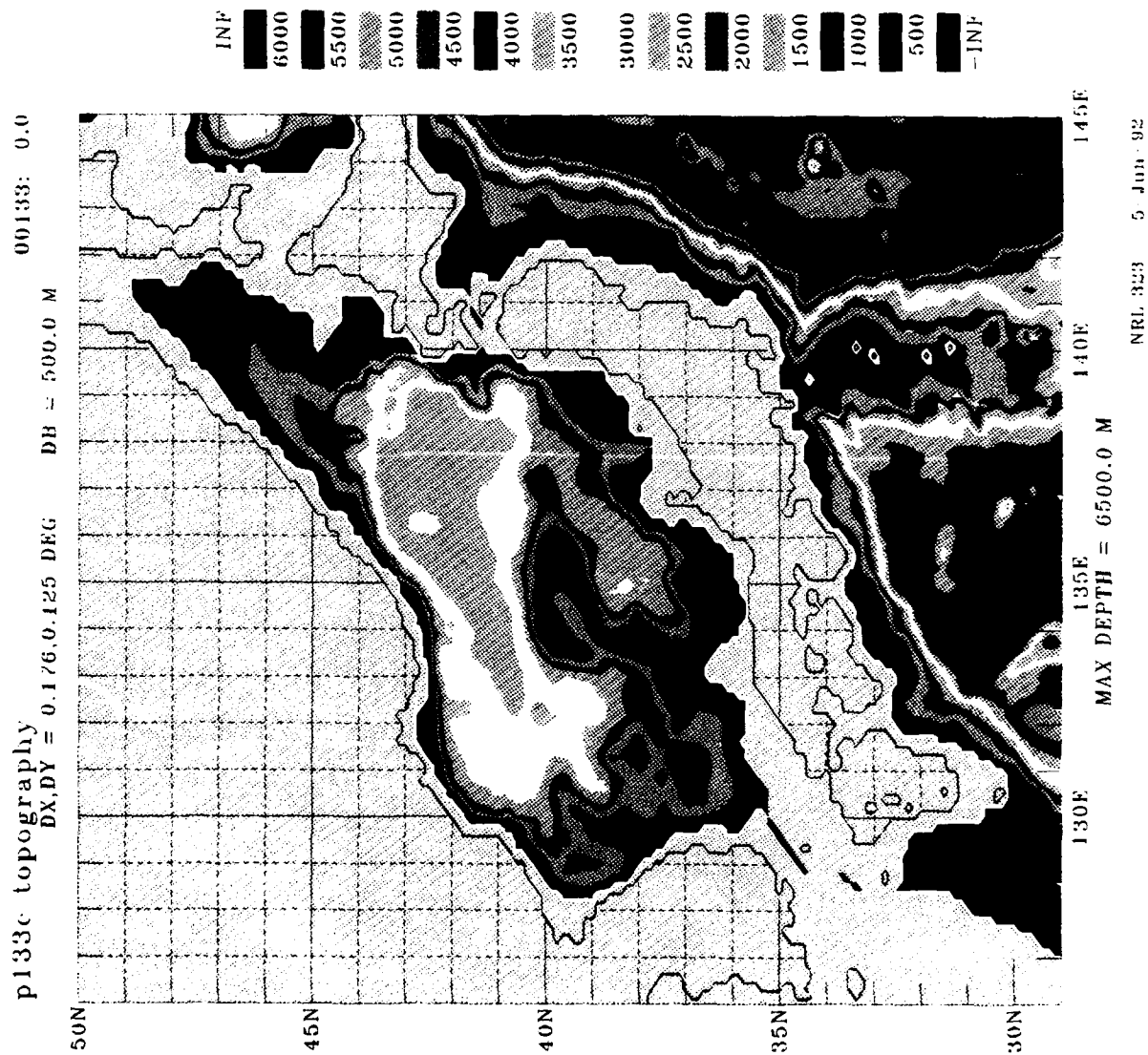


Figure 57: Plot of the Sea of Japan from the unmodified $1/8^\circ$ Pacific topography.

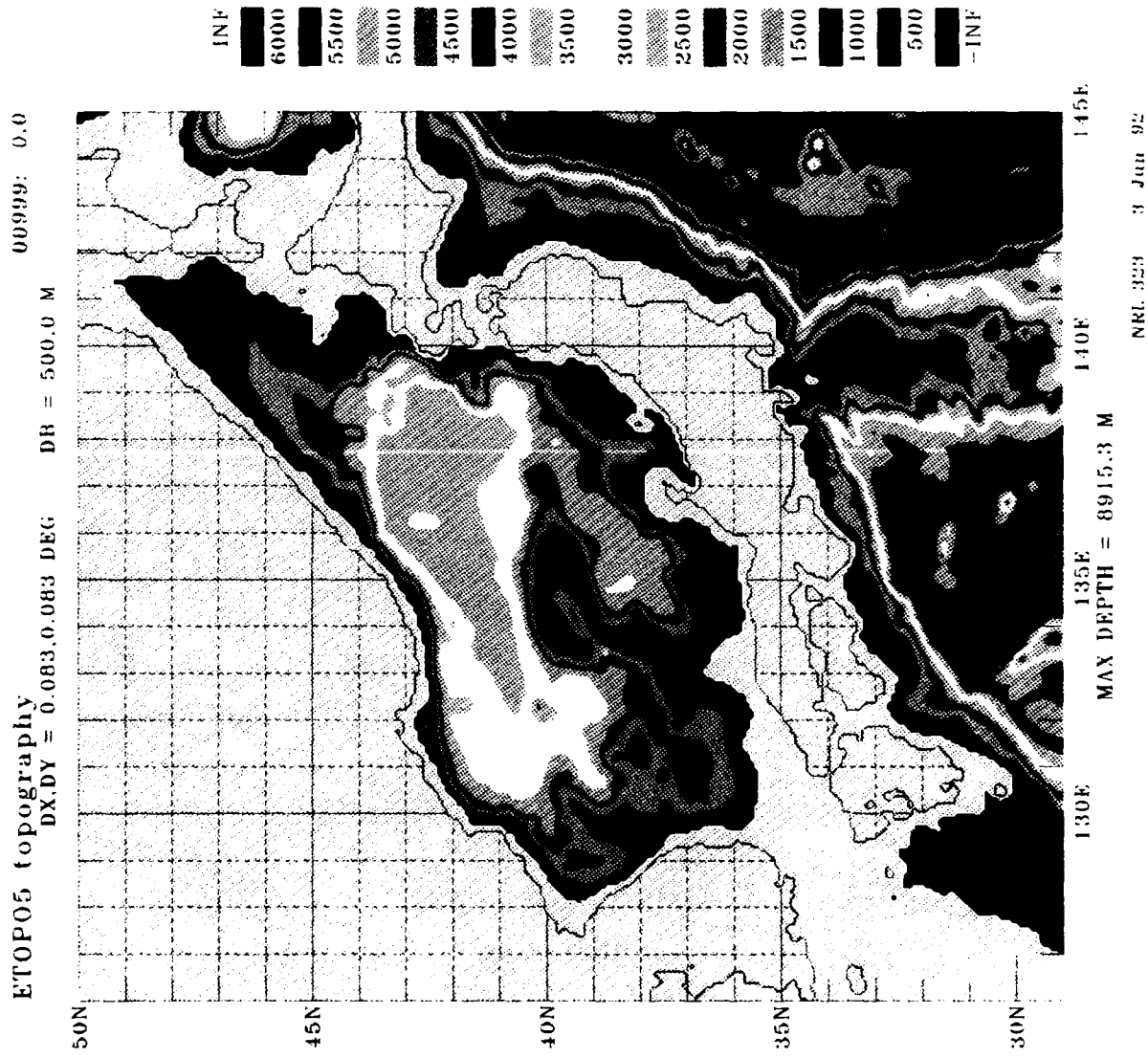


Figure 58: Plot of the Sea of Japan from the 1/12° ETOPO5 topography.

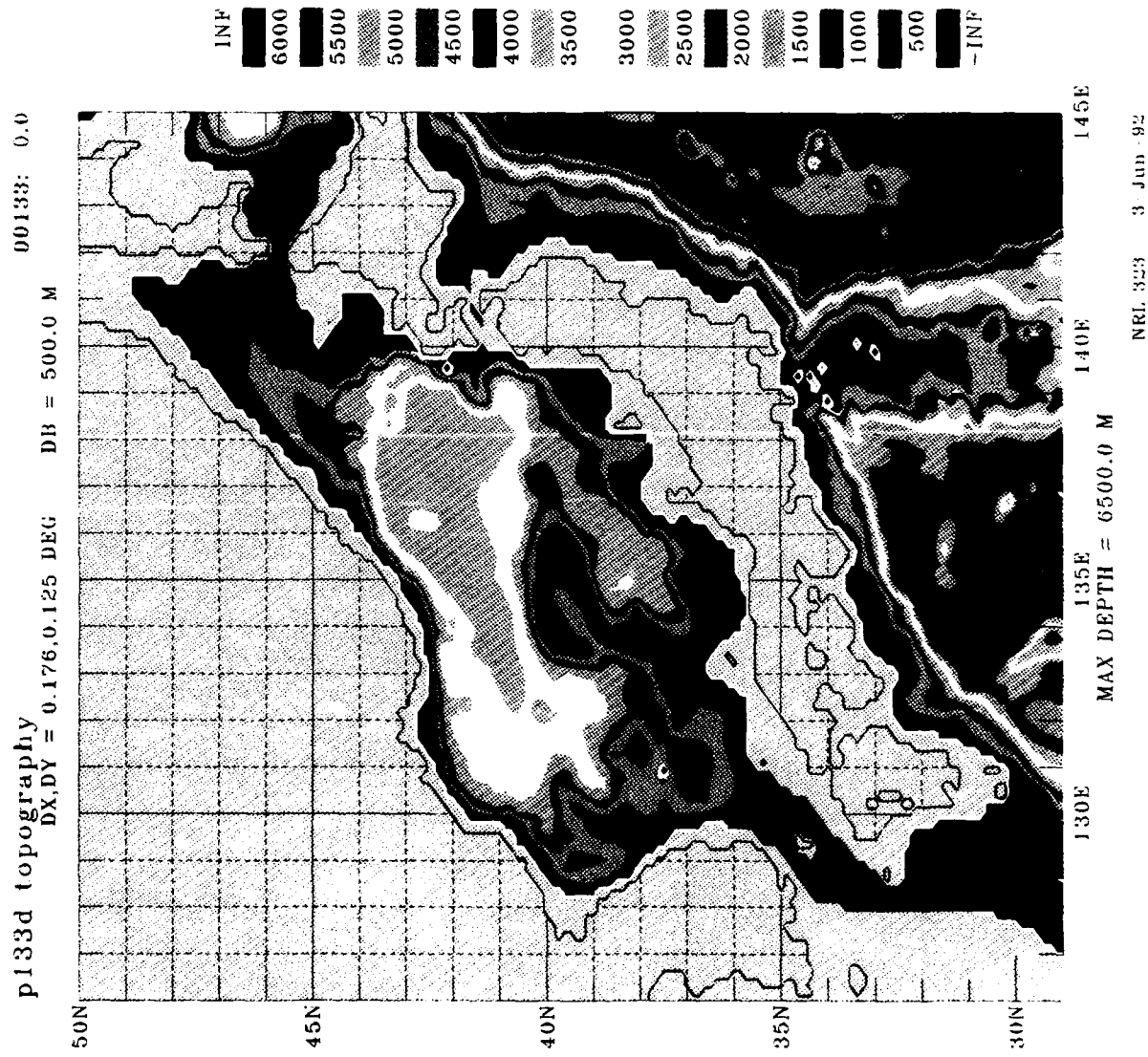


Figure 59: Plot of the Sea of Japan from the new $1/8^\circ$ Pacific topography.

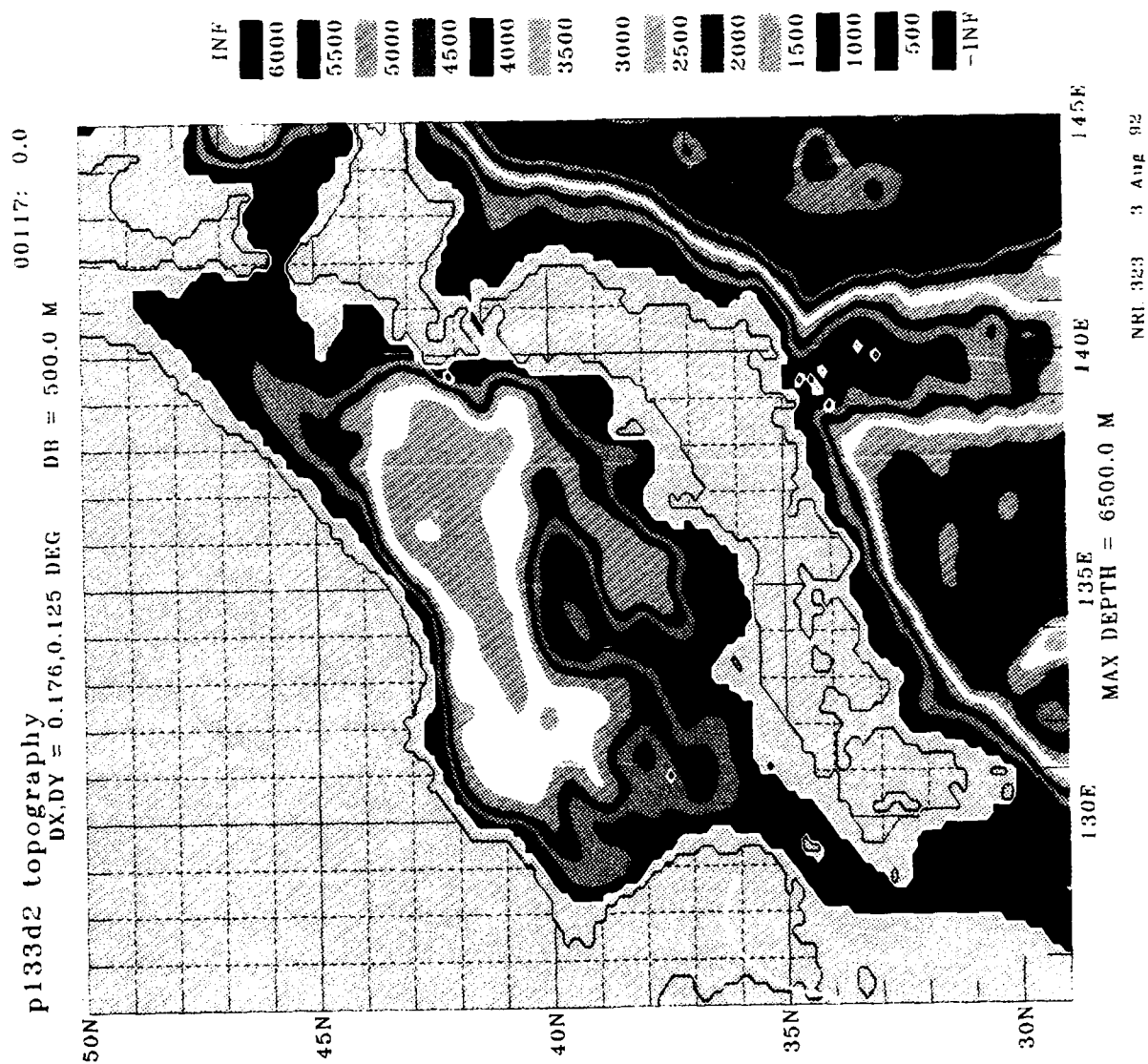


Figure 60: Plot of the Sea of Japan from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

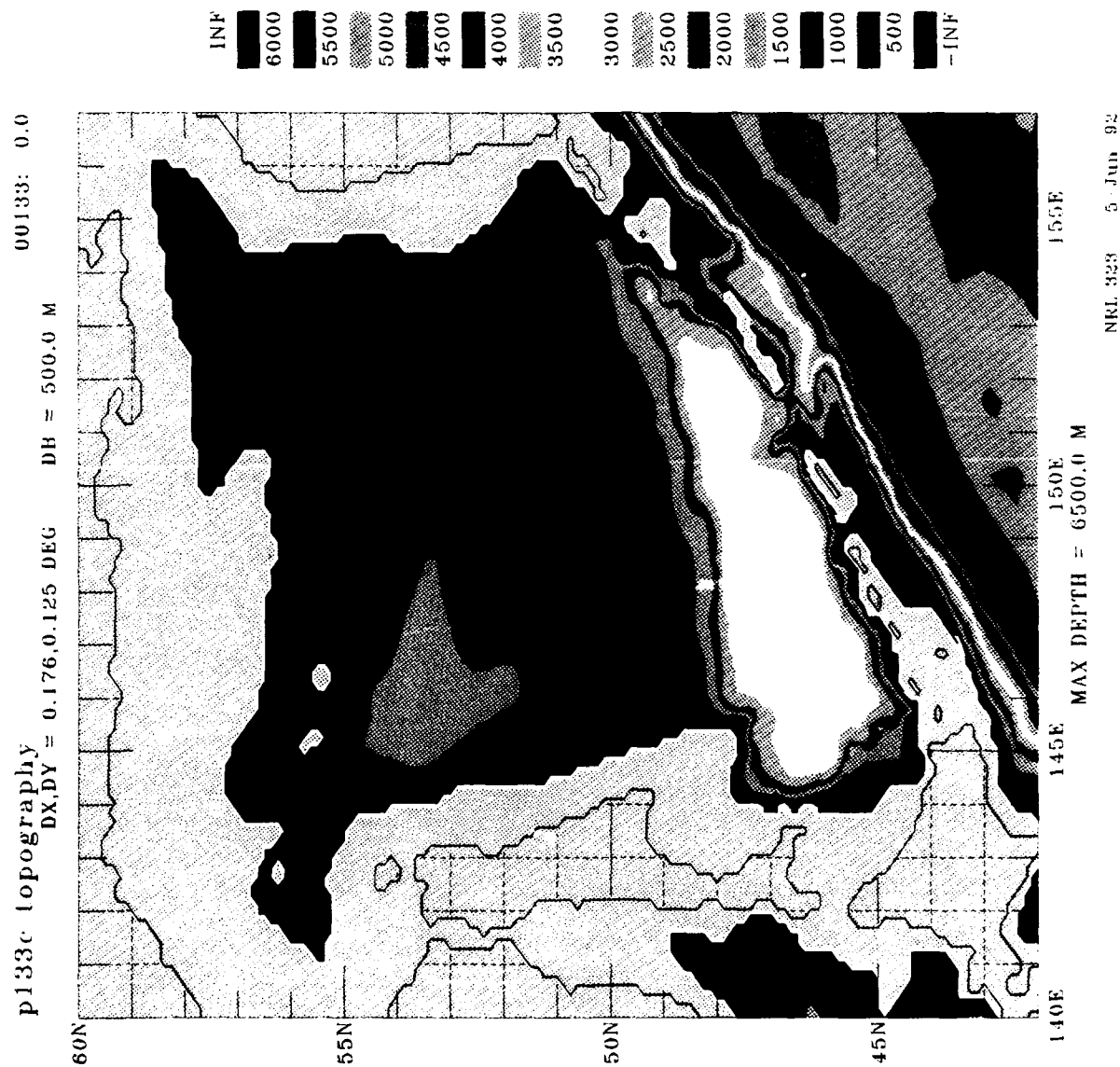


Figure 61: Plot of the Sea of Okhotsk from the unmodified $1/8^\circ$ Pacific topography.

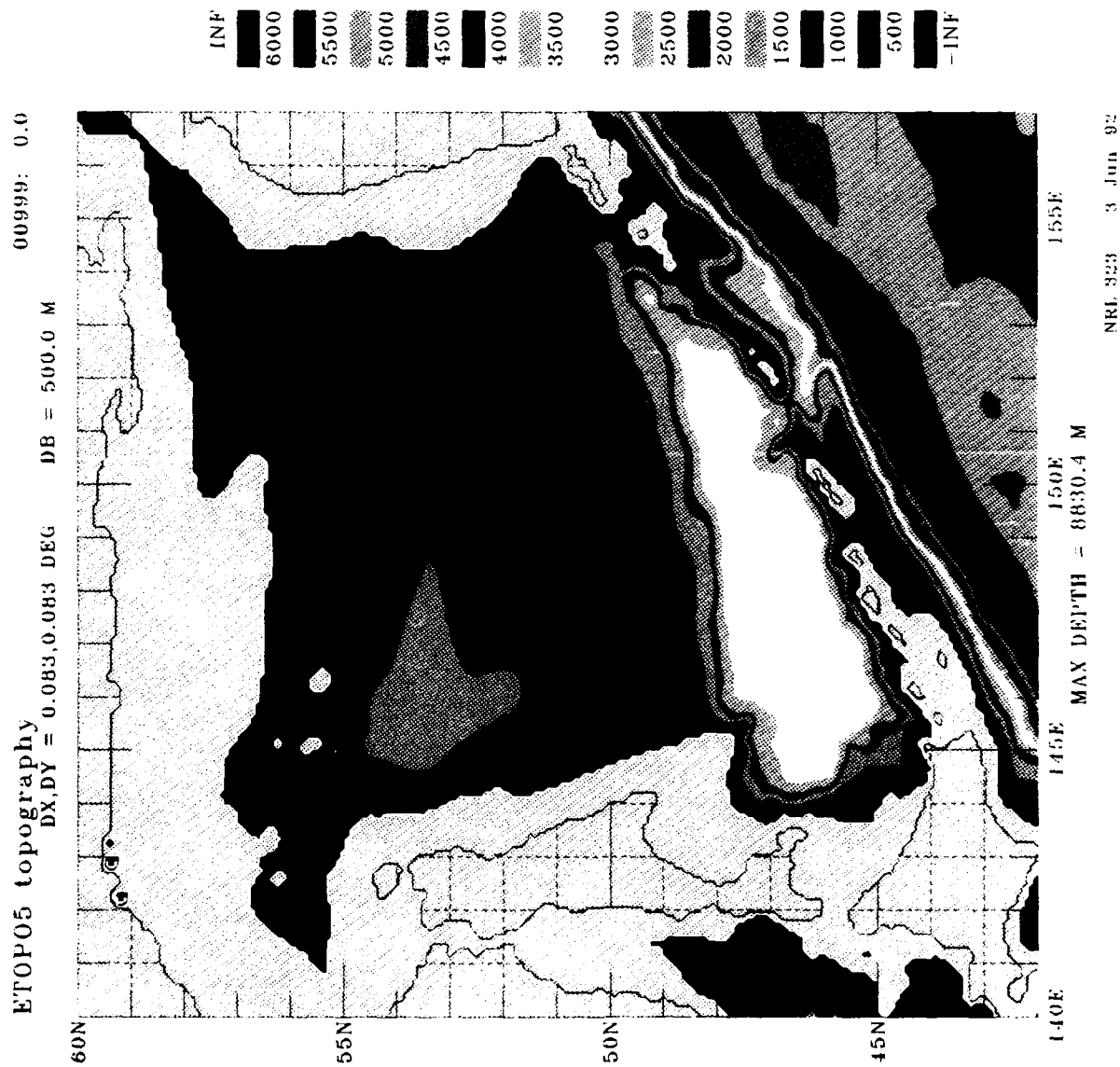


Figure 62: Plot of the Sea of Okhotsk from the 1/12° ETOPO5 topography.

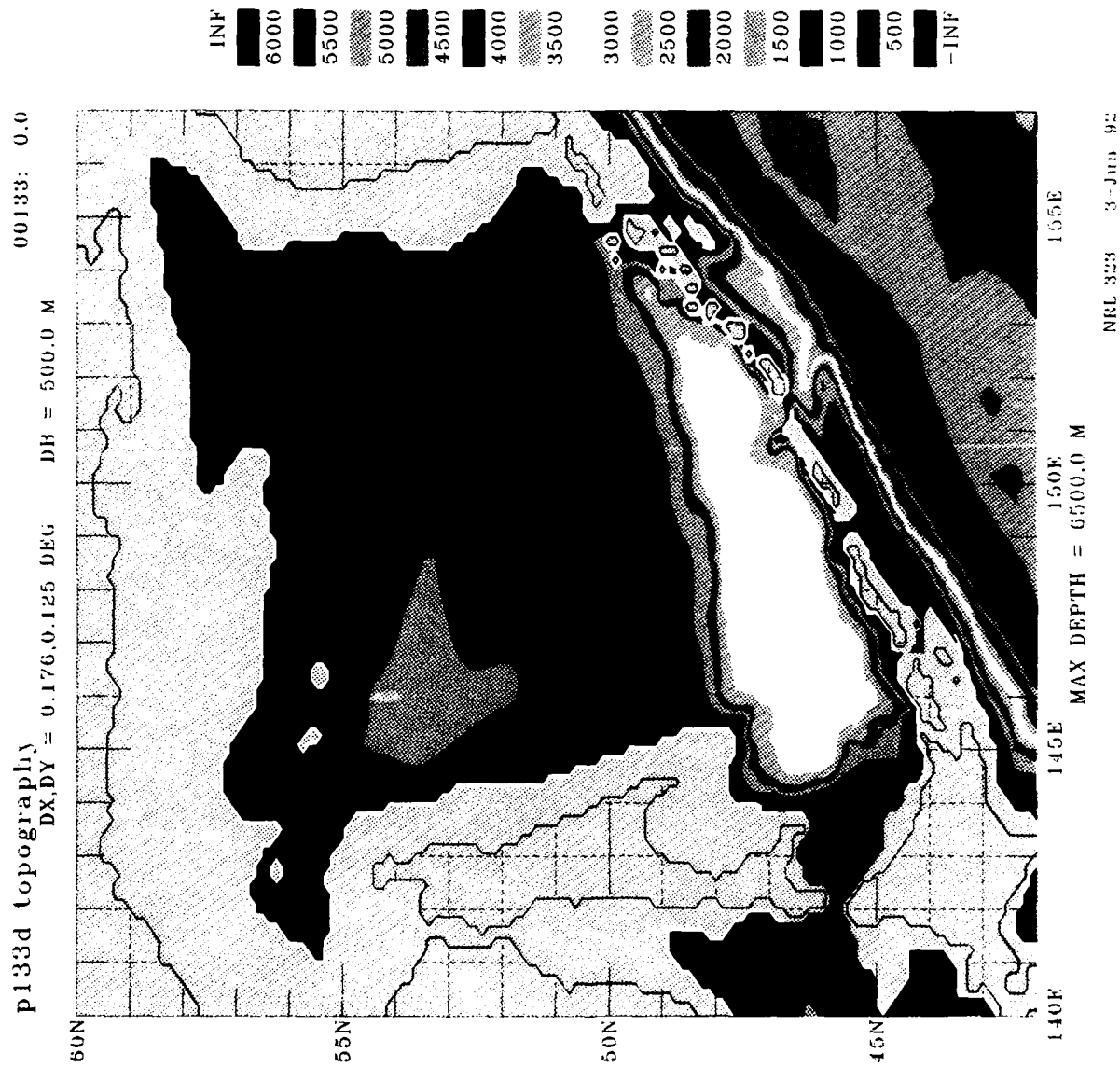


Figure 63: Plot of the Sea of Okhotsk from the new 1/8° Pacific topography.

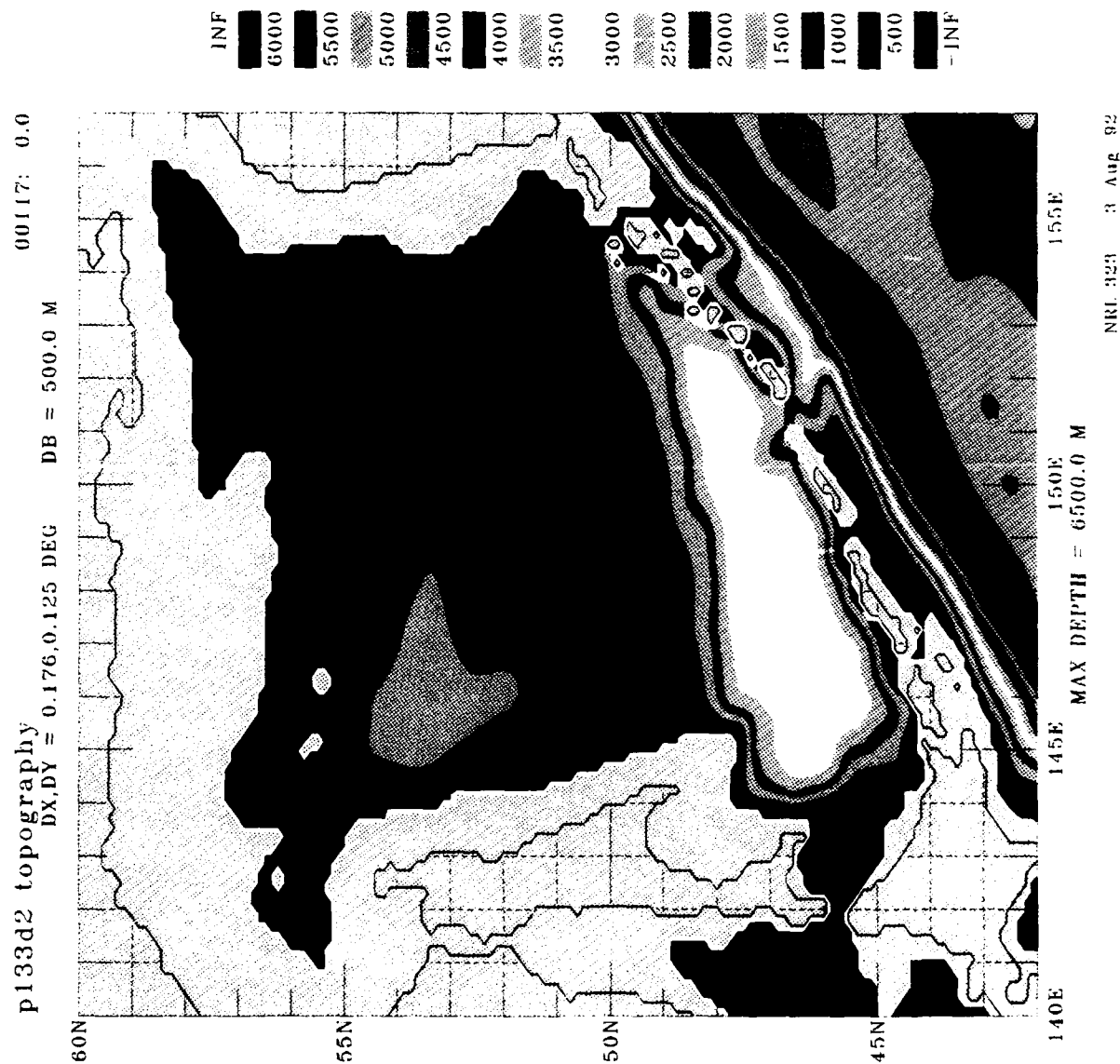


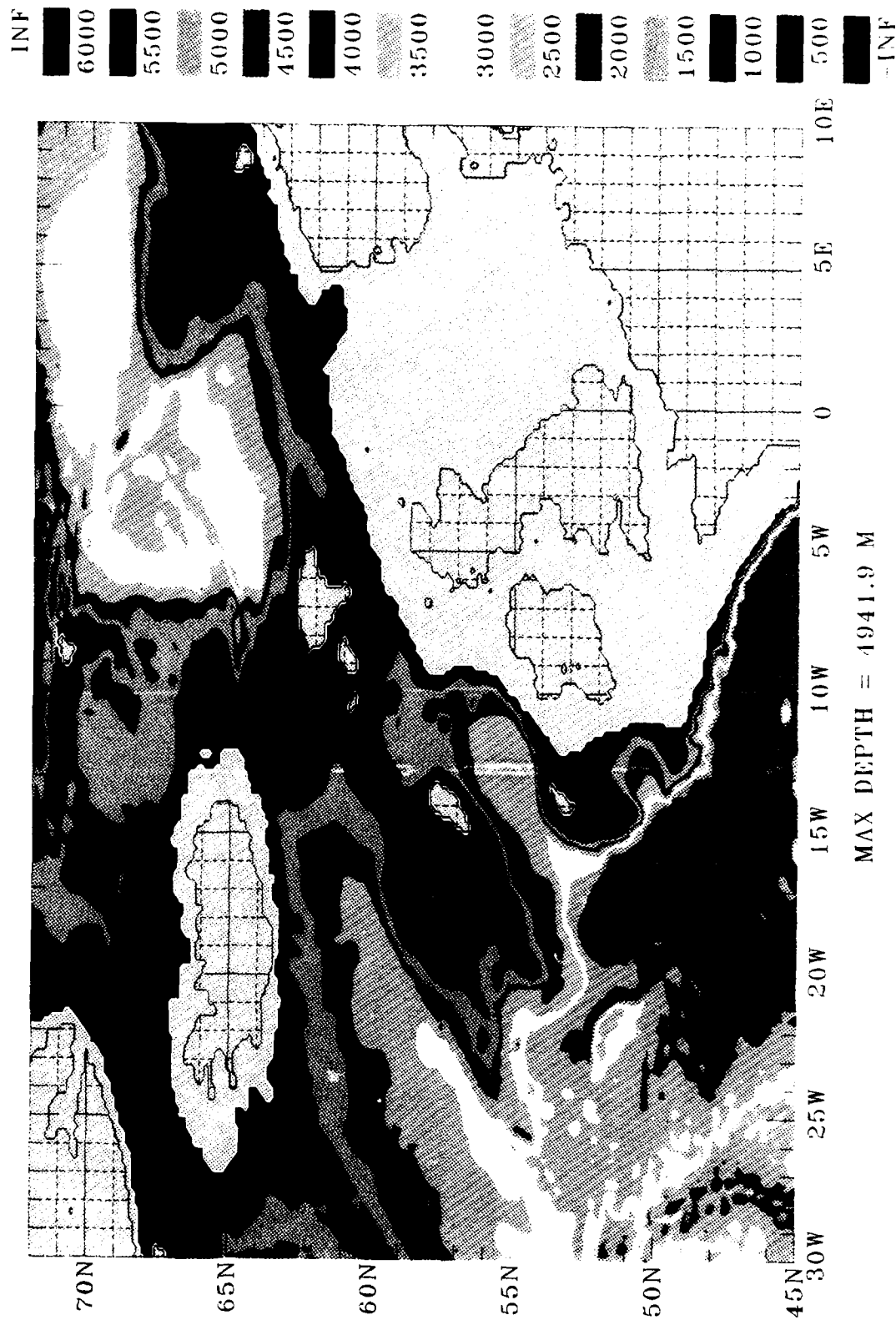
Figure 64: Plot of the Sea of Okhotsk from the new $1/8^\circ$ Pacific topography which has been smoothed by two passes of a 9-point smoother.

global 1/8 deg topography

DX,DY = 0.176,0.125 DEG

DB = 500.0 M

00800: 0.0



MAX DEPTH = 4941.9 M

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Figure 65: Plot of the GIN Sea from the unmodified 1/8° global topography.

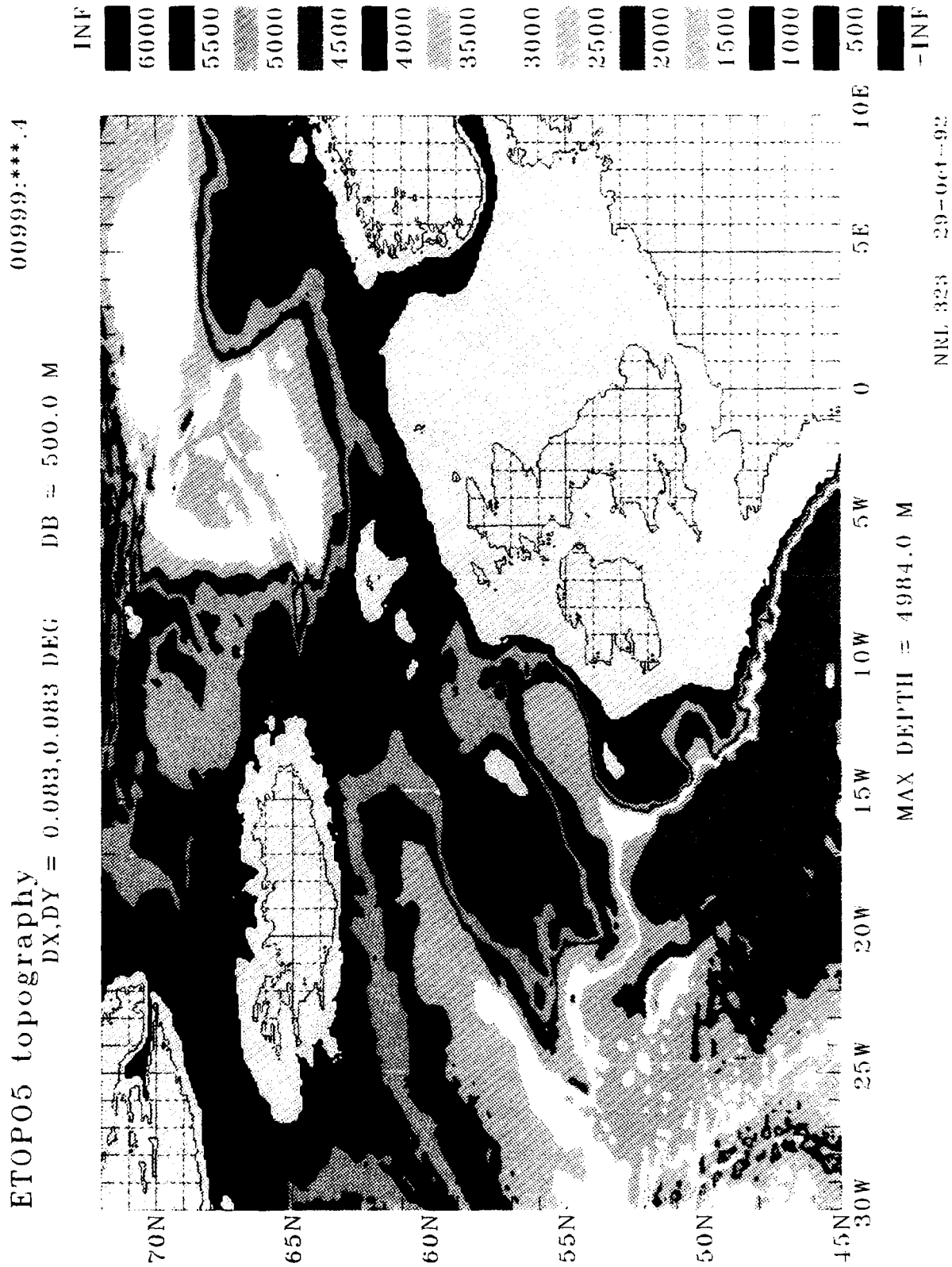


Figure 66: Plot of the GIN Sea from the 1/12° ETOP05 topography.

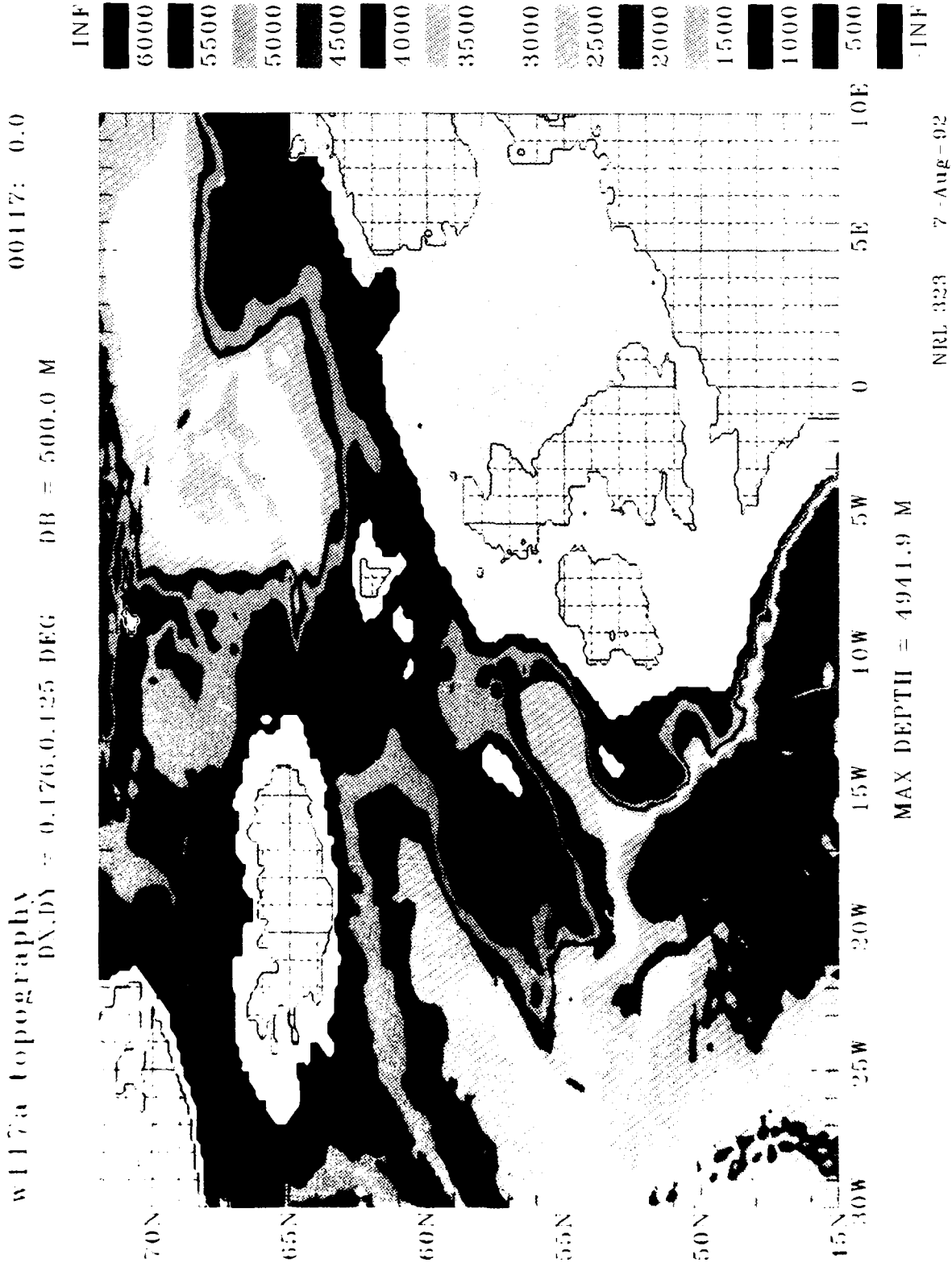


Figure 67: Plot of the GIN Sea from the new $1/8^\circ$ Atlantic topography.

w117a2 topography

00117: 0.0

DX,DY = 0.176,0.125 DEG DB = 500.0 M

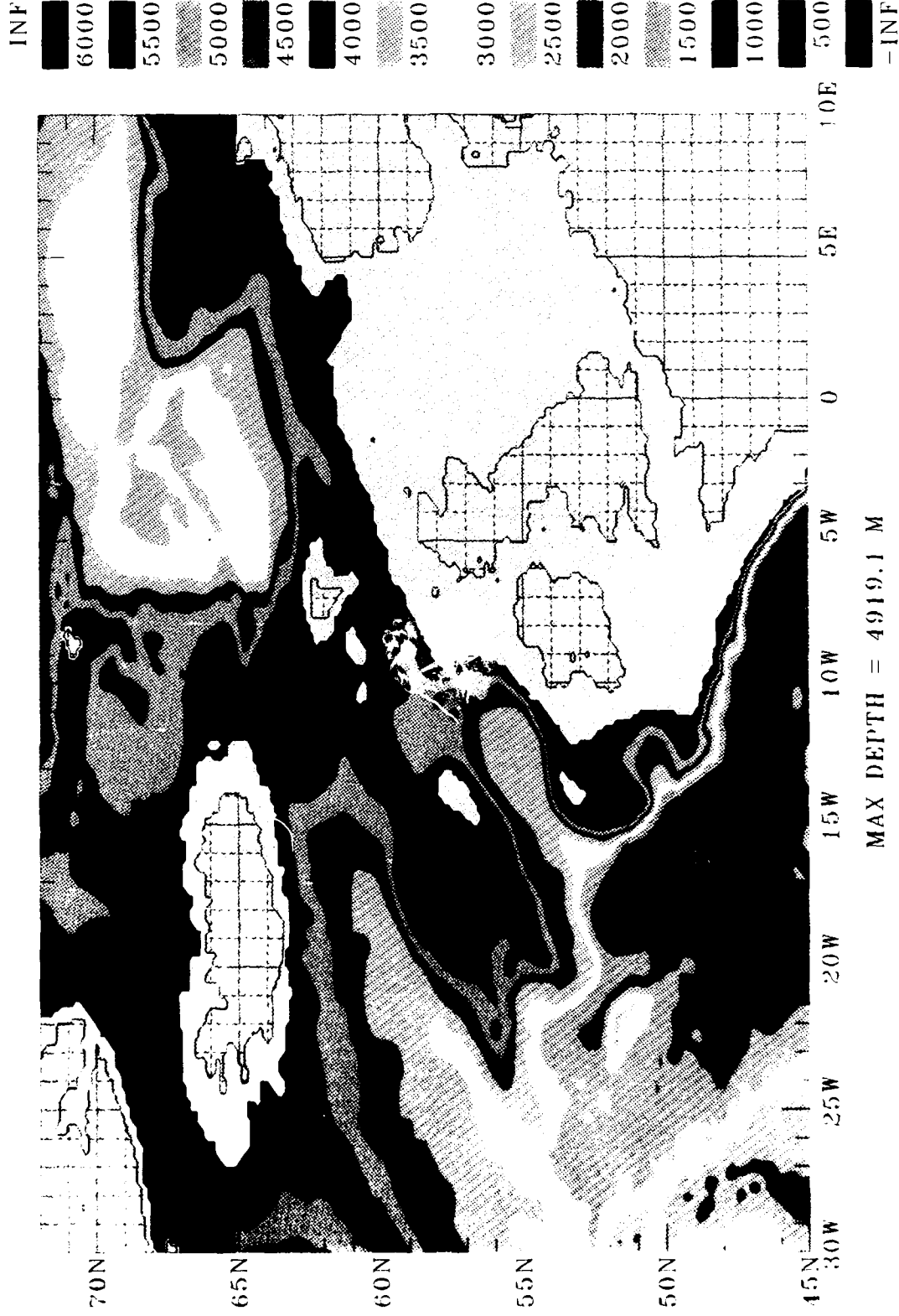


Figure 68: Plot of the GIN Sea from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

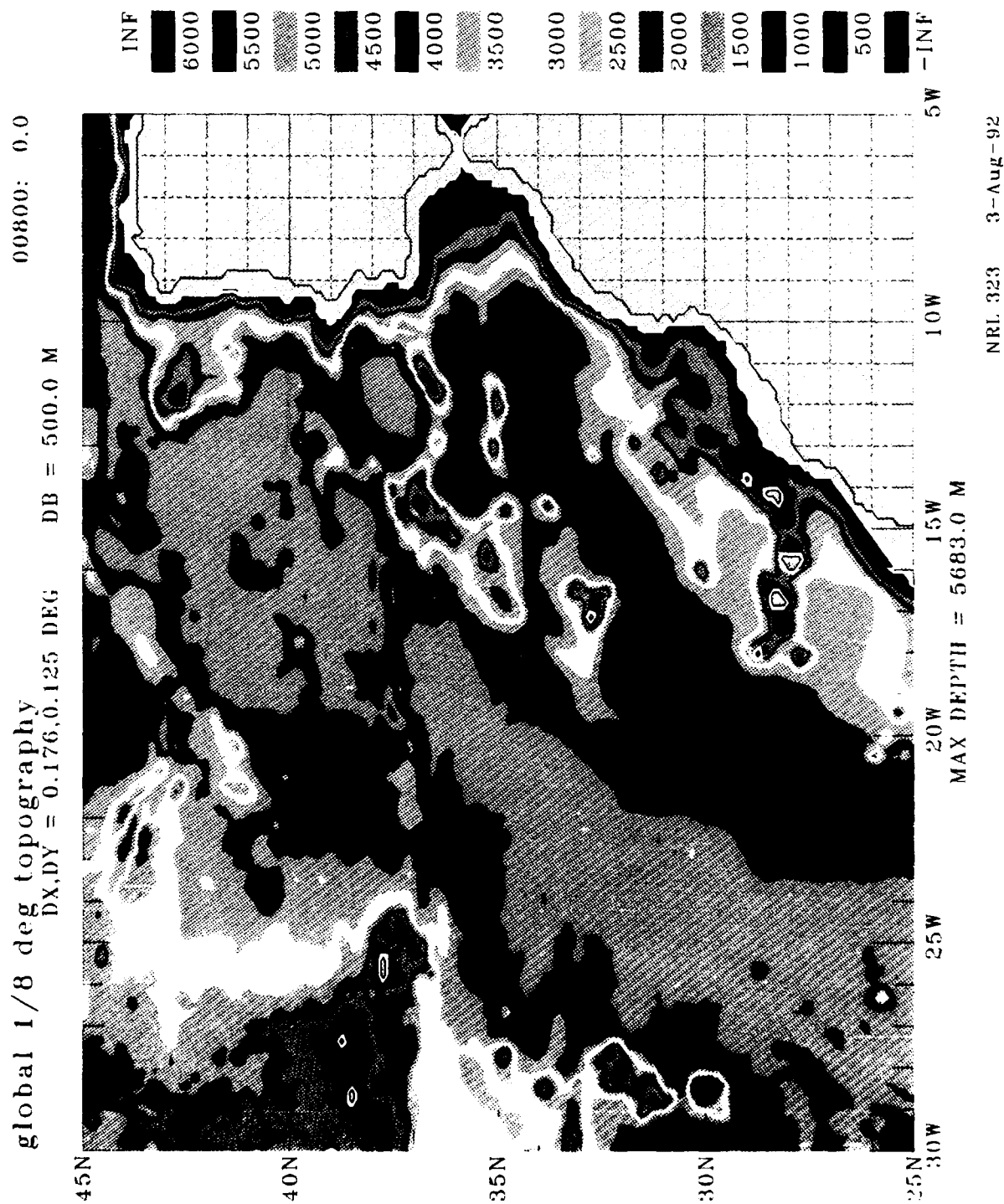
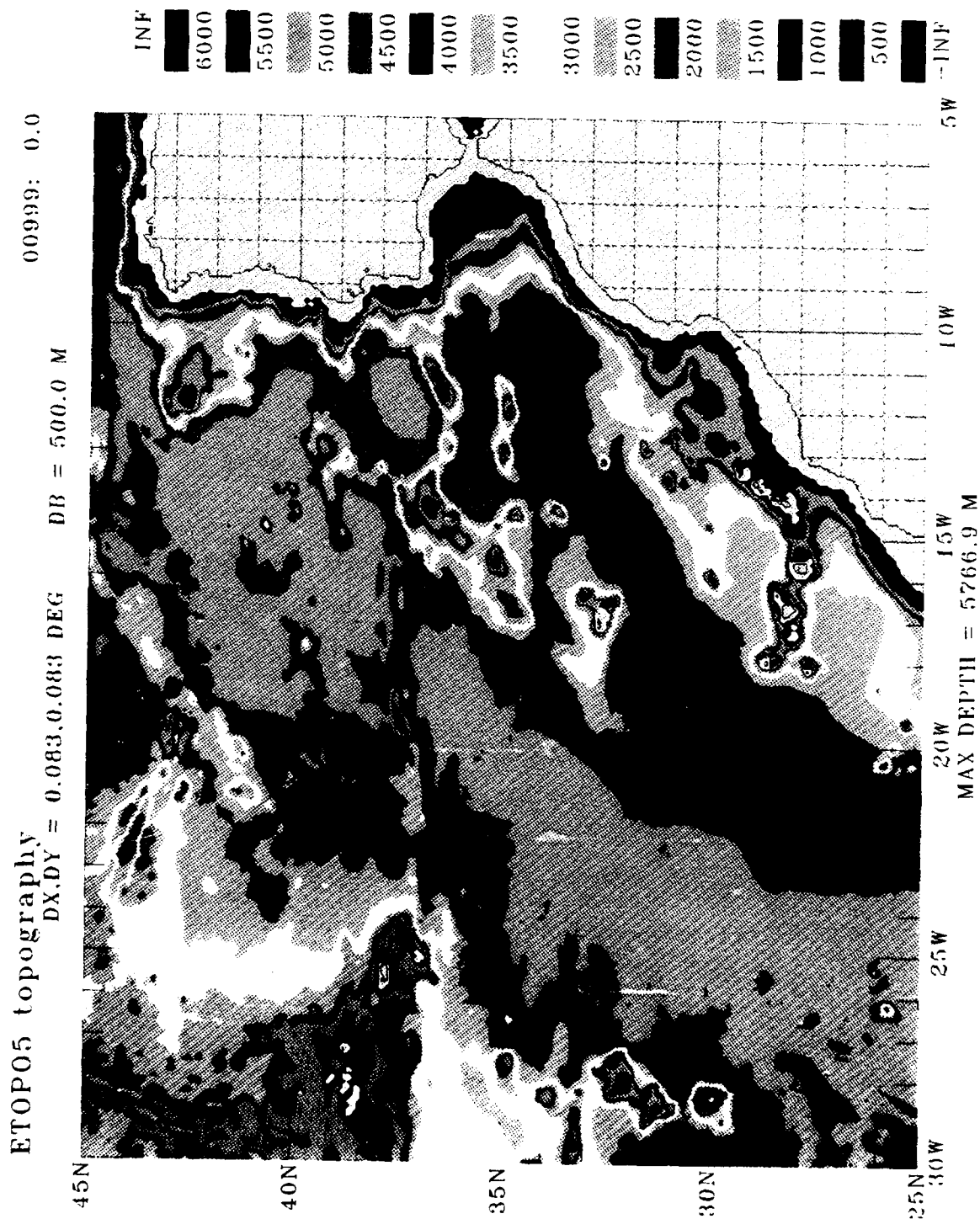
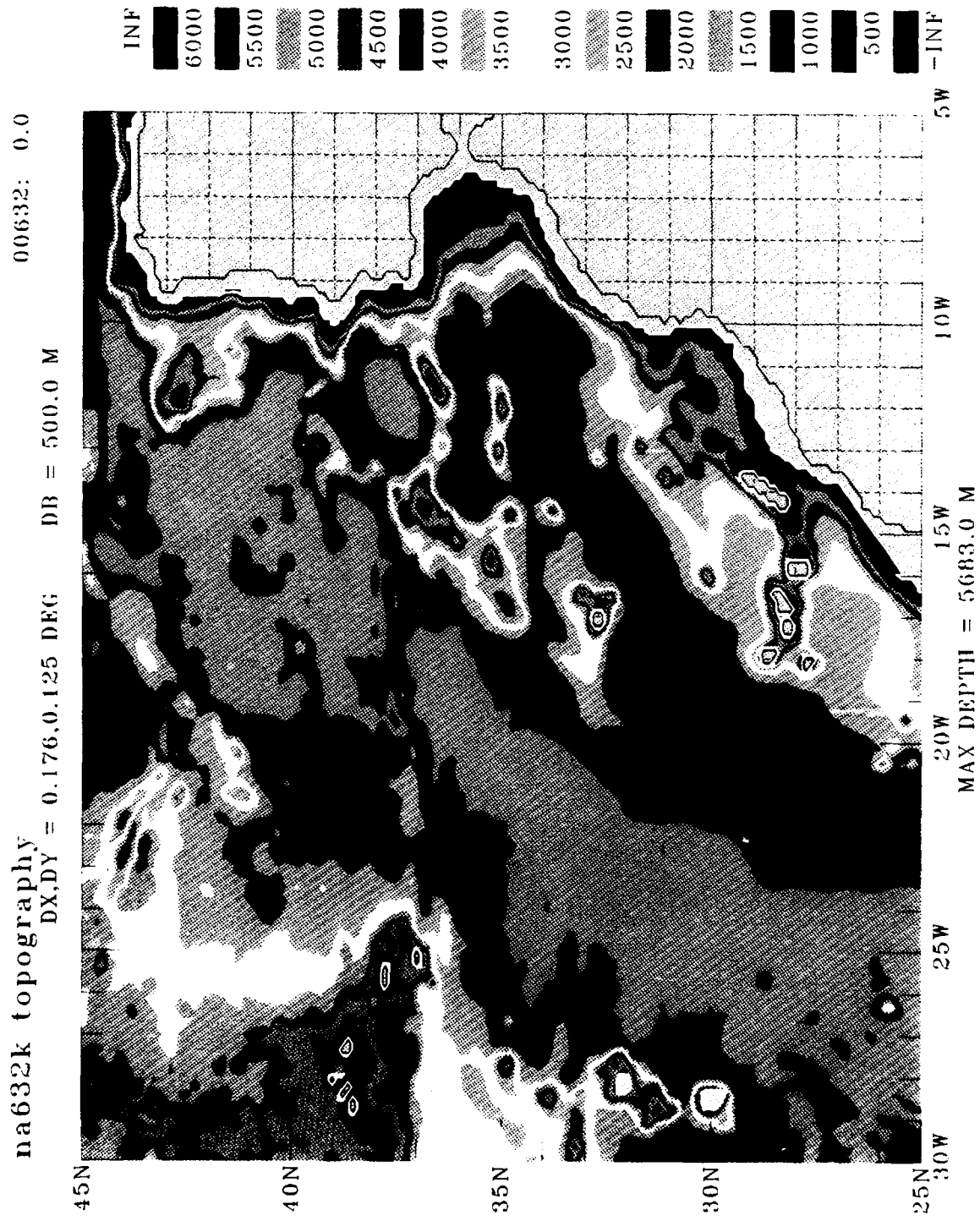


Figure 69: Plot of the Canary and Azore Islands from the unmodified 1/8° global topography.



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Figure 70: Plot of the Canary and Azore Islands from the 1/12° ETOPO5 topography.



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Figure 71: Plot of the Canary and Azore Islands from the new $1/8^\circ$ Atlantic topography.

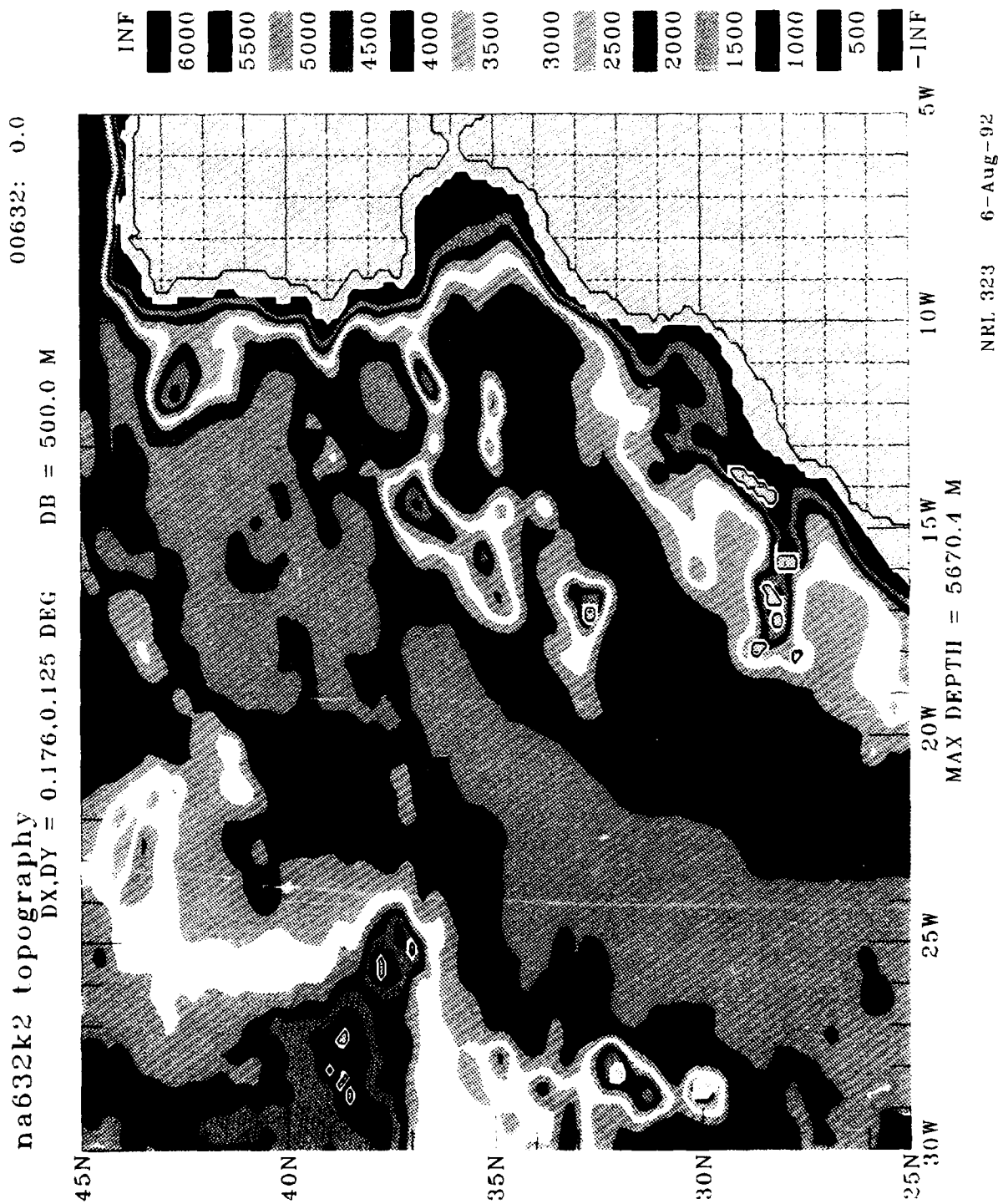


Figure 72: Plot of the Canary and Azore Islands from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

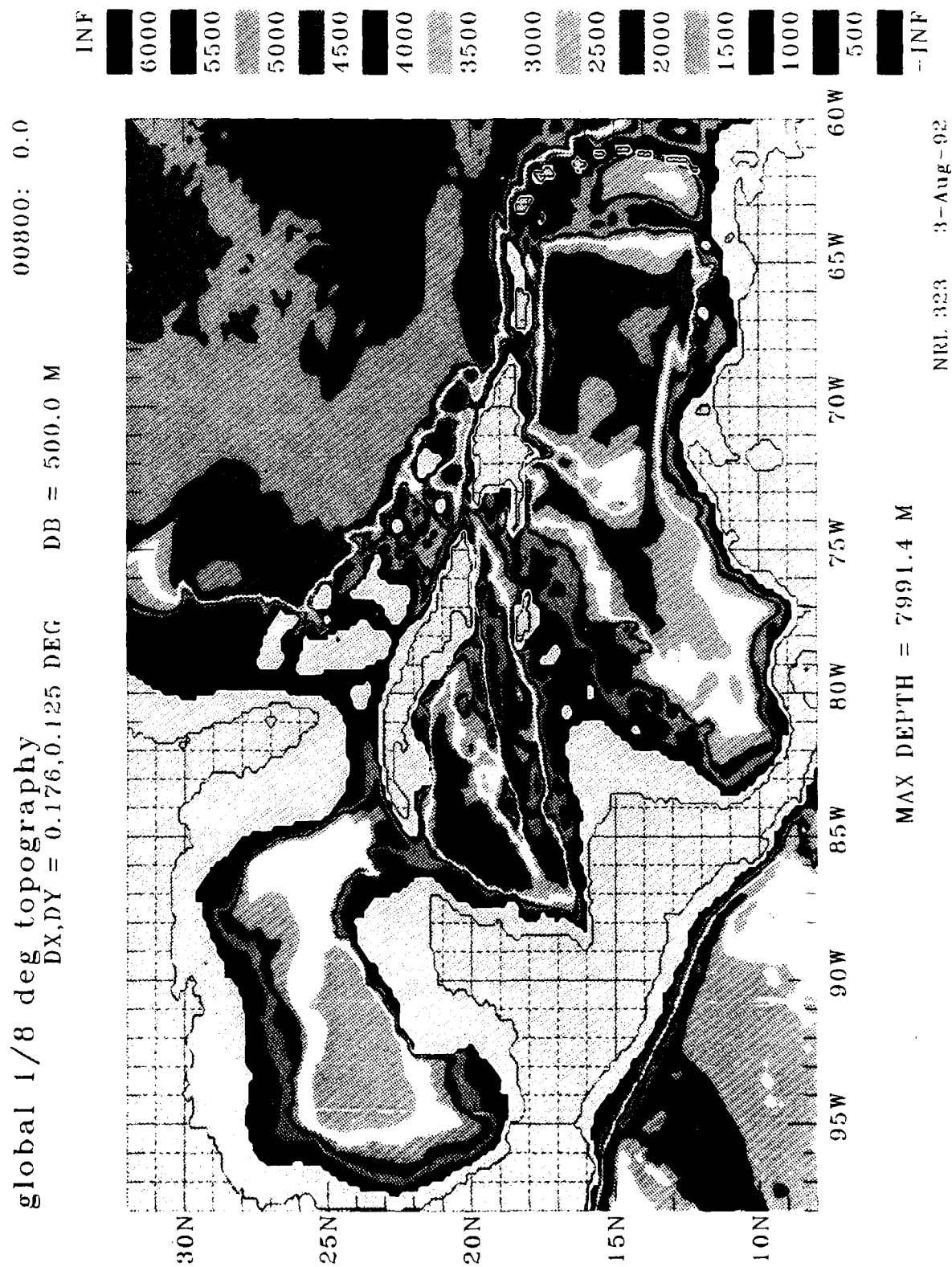


Figure 73: Plot of the Carribean Sea and Gulf of Mexico from the unmodified 1/8° global topography.

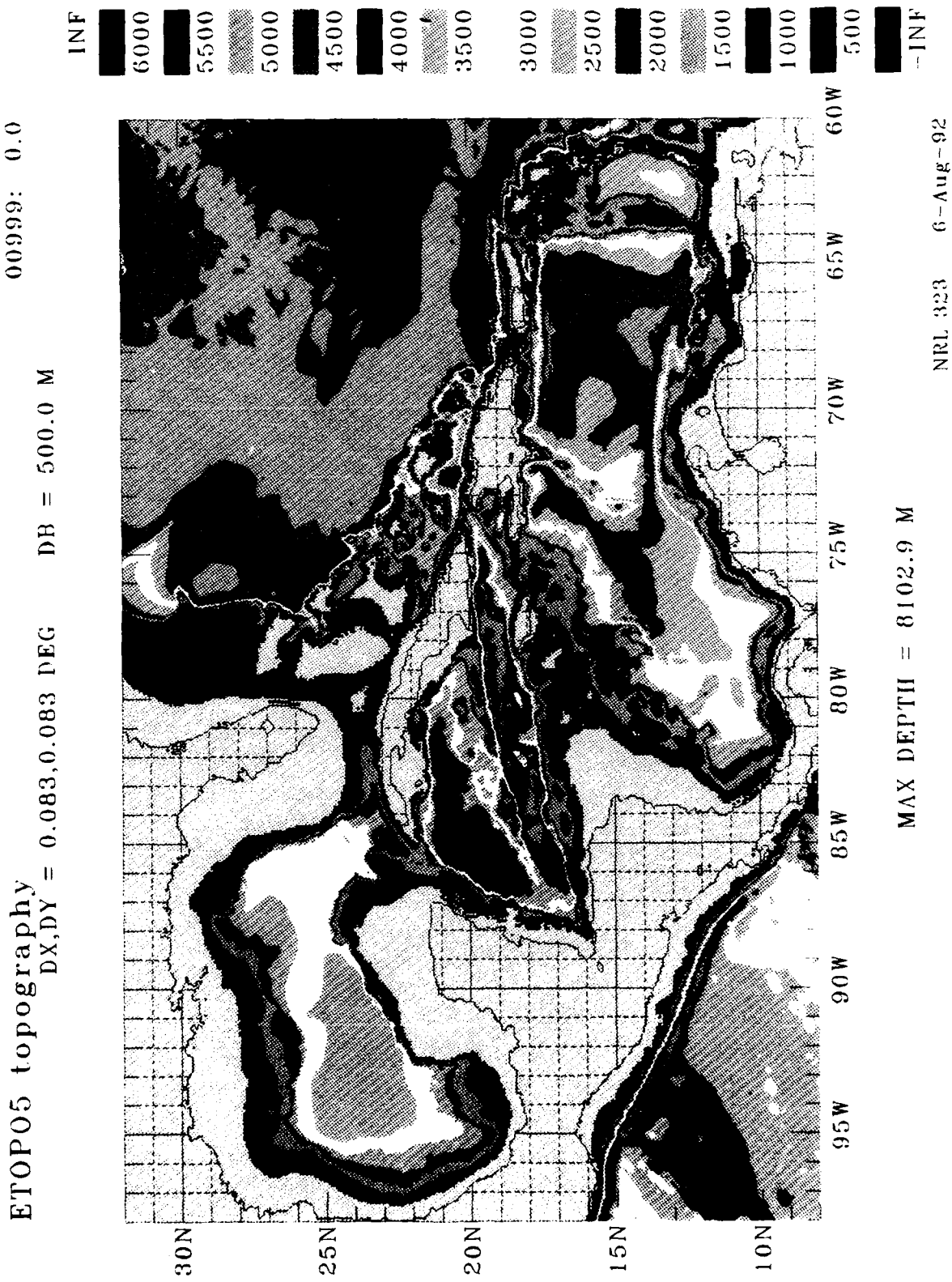


Figure 74: Plot of the Caribbean Sea and Gulf of Mexico from the 1/12° ETOPO5 topography.

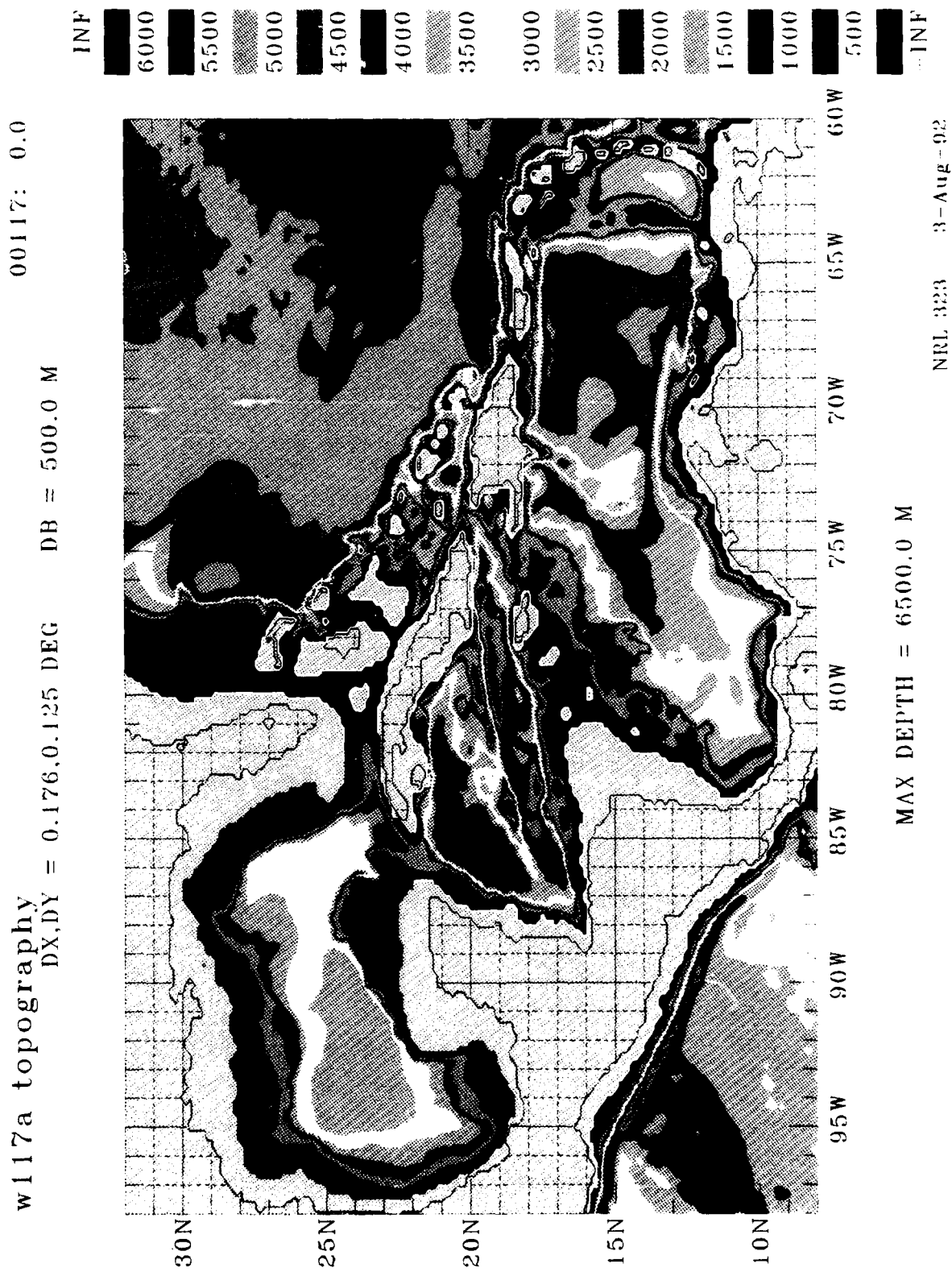


Figure 75: Plot of the Caribbean Sea and Gulf of Mexico from the new 1/8° Atlantic topography.

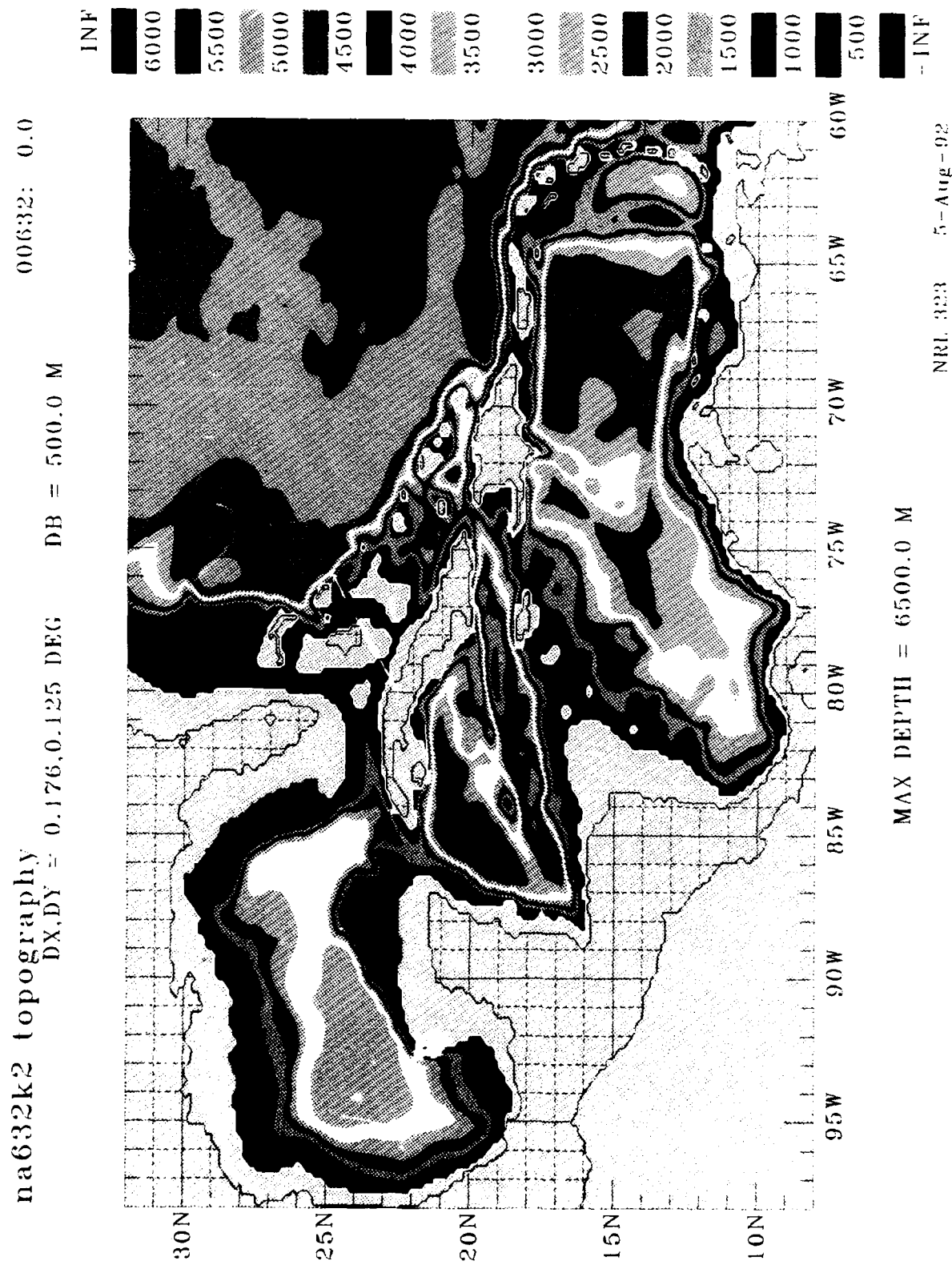


Figure 76: Plot of the Caribbean Sea and Gulf of Mexico from the new $1/8^\circ$ Atlantic topography which has been smoothed by two passes of a 9-point smoother.

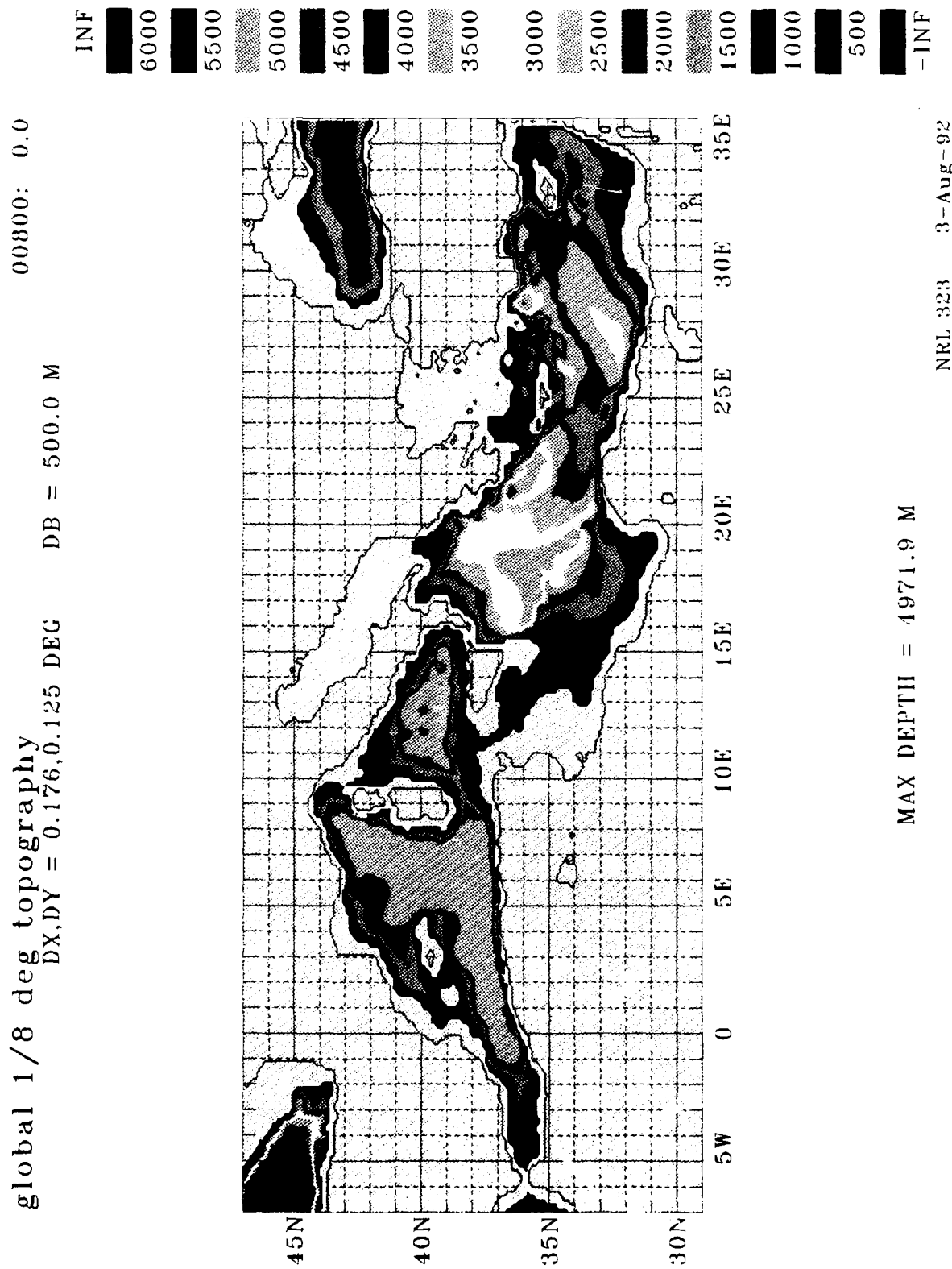


Figure 77: Plot of the Mediterranean Sea from the unmodified 1/8° global topography.

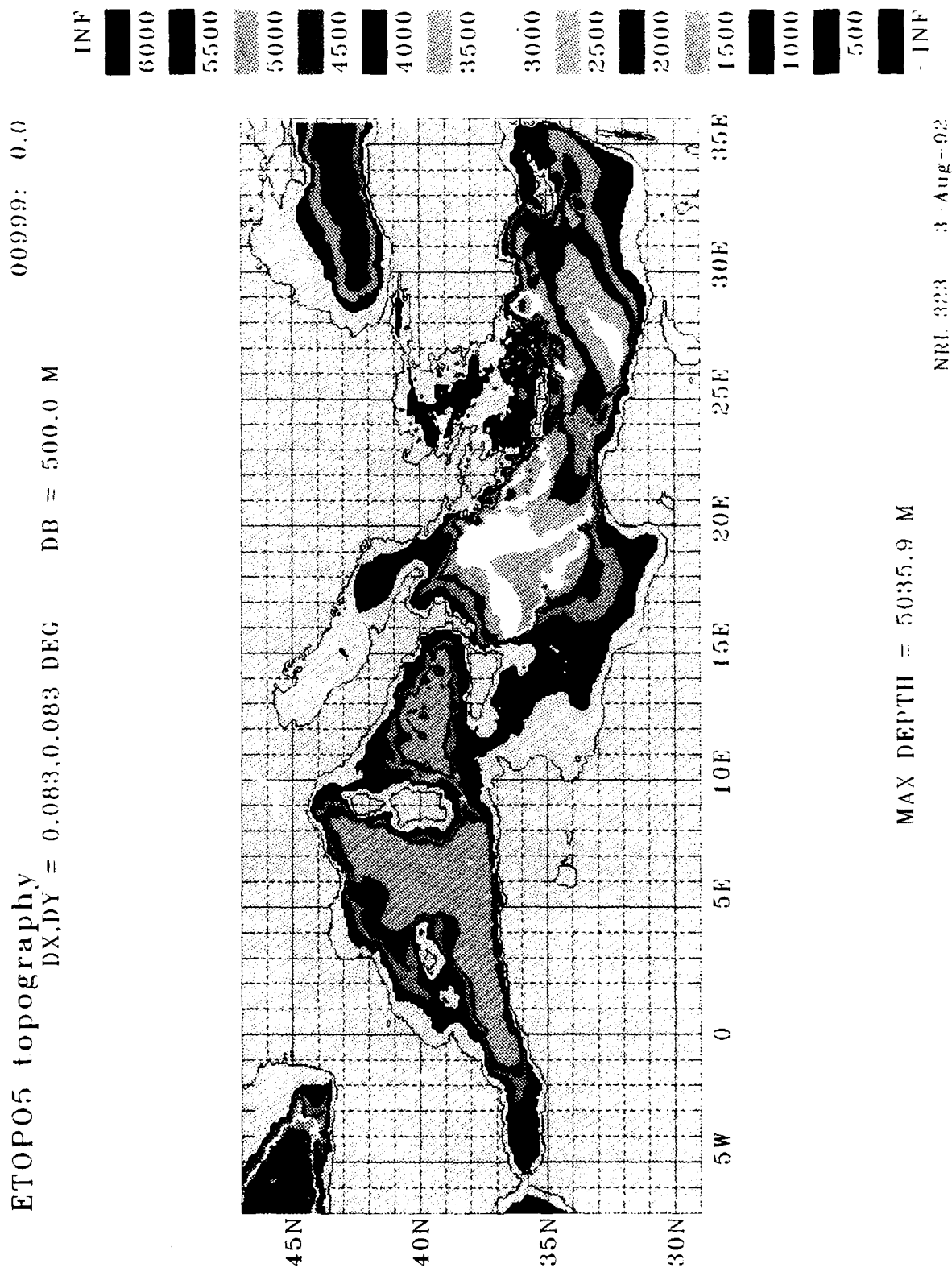


Figure 78: Plot of the Mediterranean Sea from the 1/12° ETOPO5 topography.

w117a topography

00117: 0.0

DX,DY = 0.176,0.125 DEG DB = 500.0 M

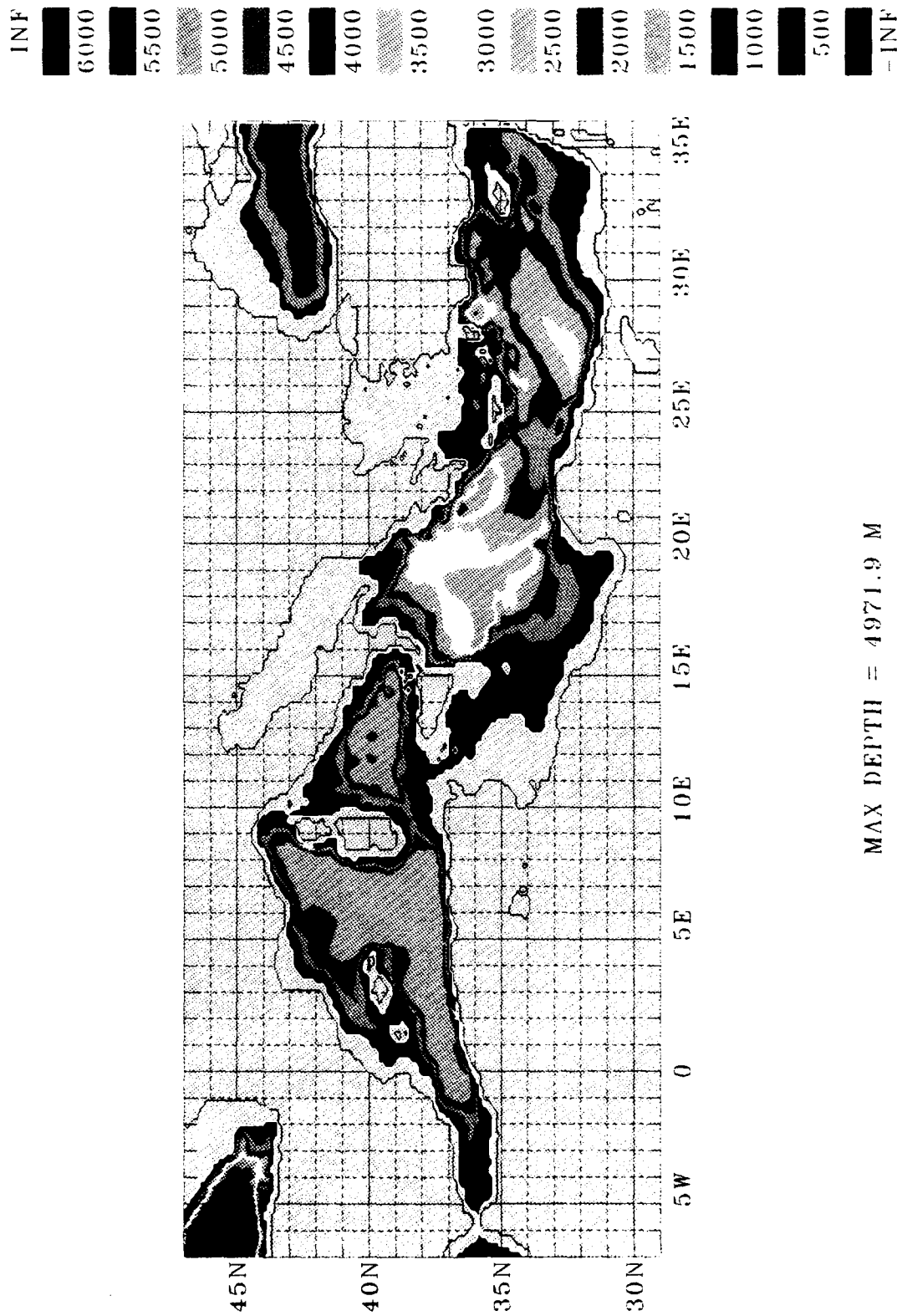


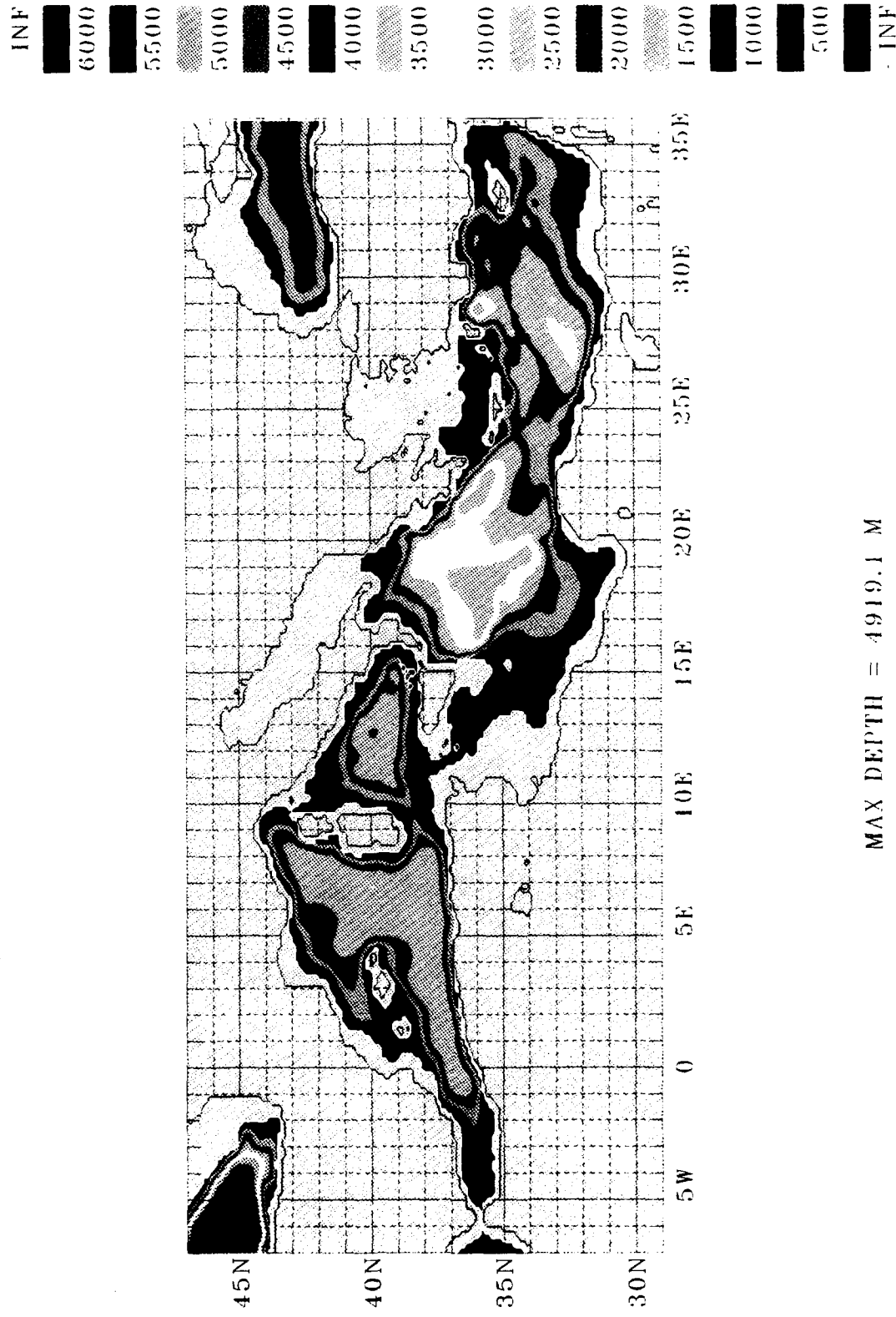
Figure 79: Plot of the Mediterranean Sea from the new 1/8° Atlantic topography.

w117a2 topography

DX,DY = 0.176,0.125 DEG

DB = 500.0 M

00117: 0.0



MAX DEPTH = 4919.1 M

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Figure 80: Plot of the Mediterranean Sea from the new 1/8° Atlantic topography which has been smoothed by two passes of a 9-point smoother.

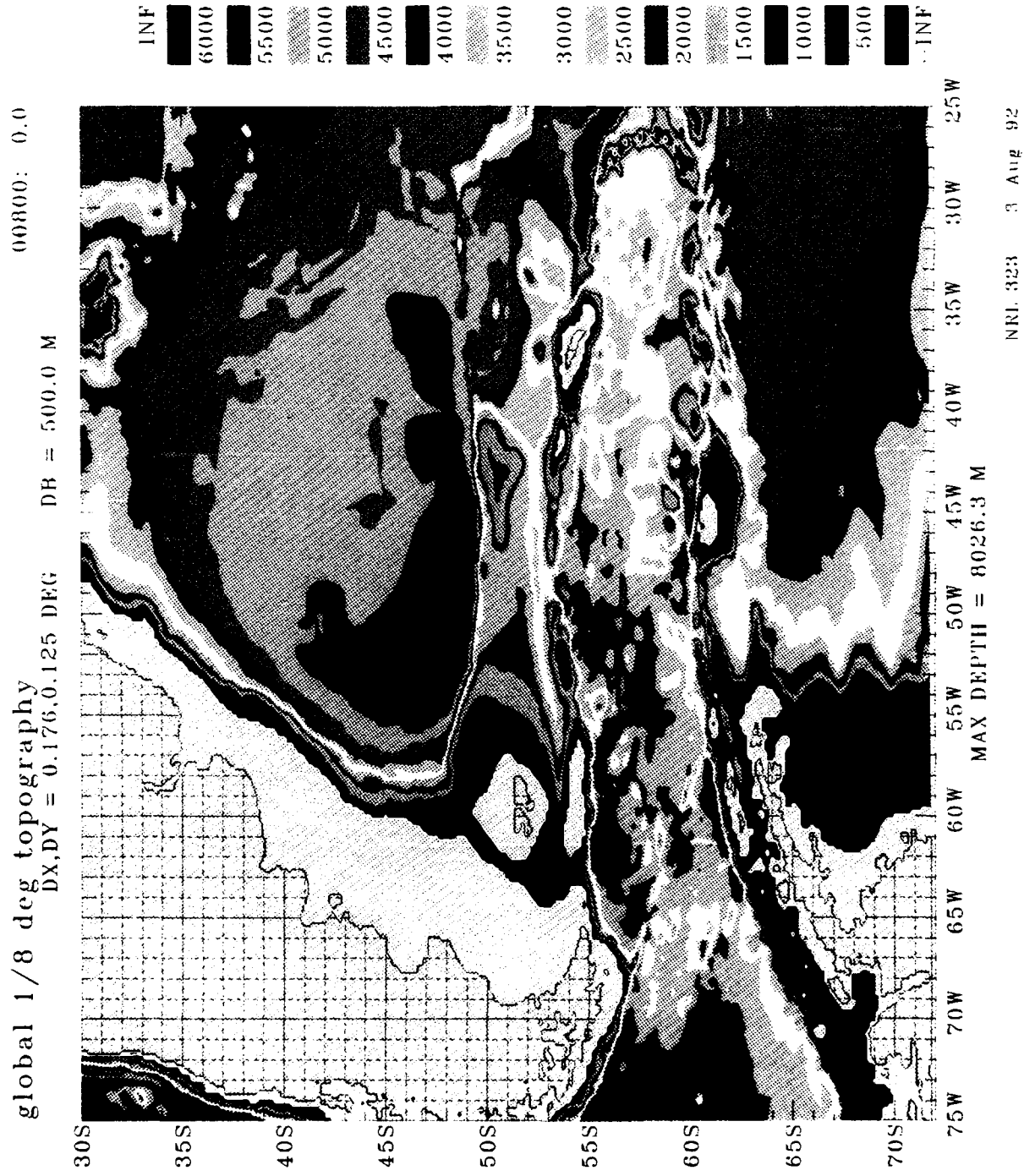


Figure 81: Plot of the Drake Passage and the Falkland Islands from the unmodified 1/8° global topography.

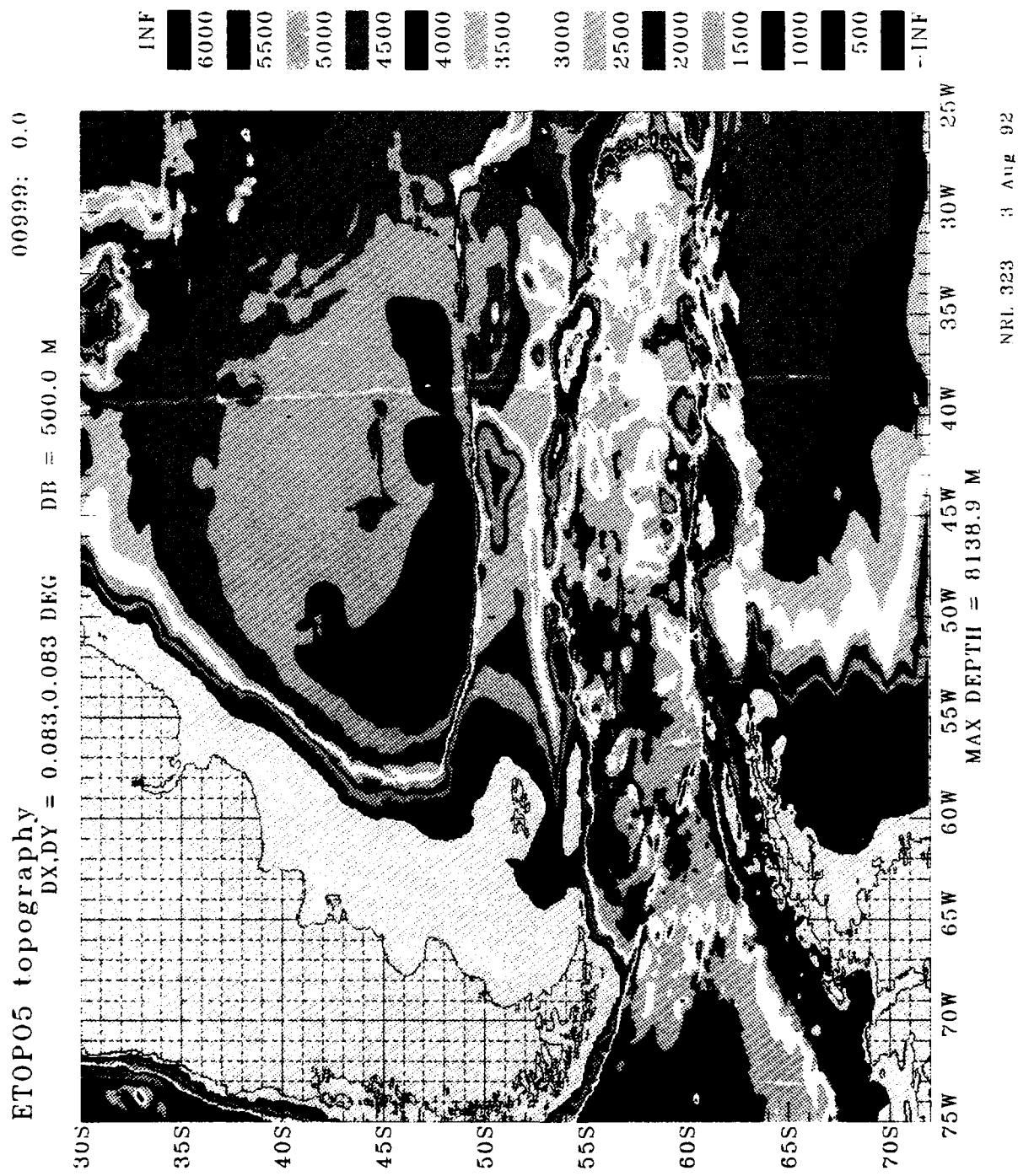


Figure 82: Plot of the Drake Passage and the Falkland Islands from the 1/12° ETOP05 topography.

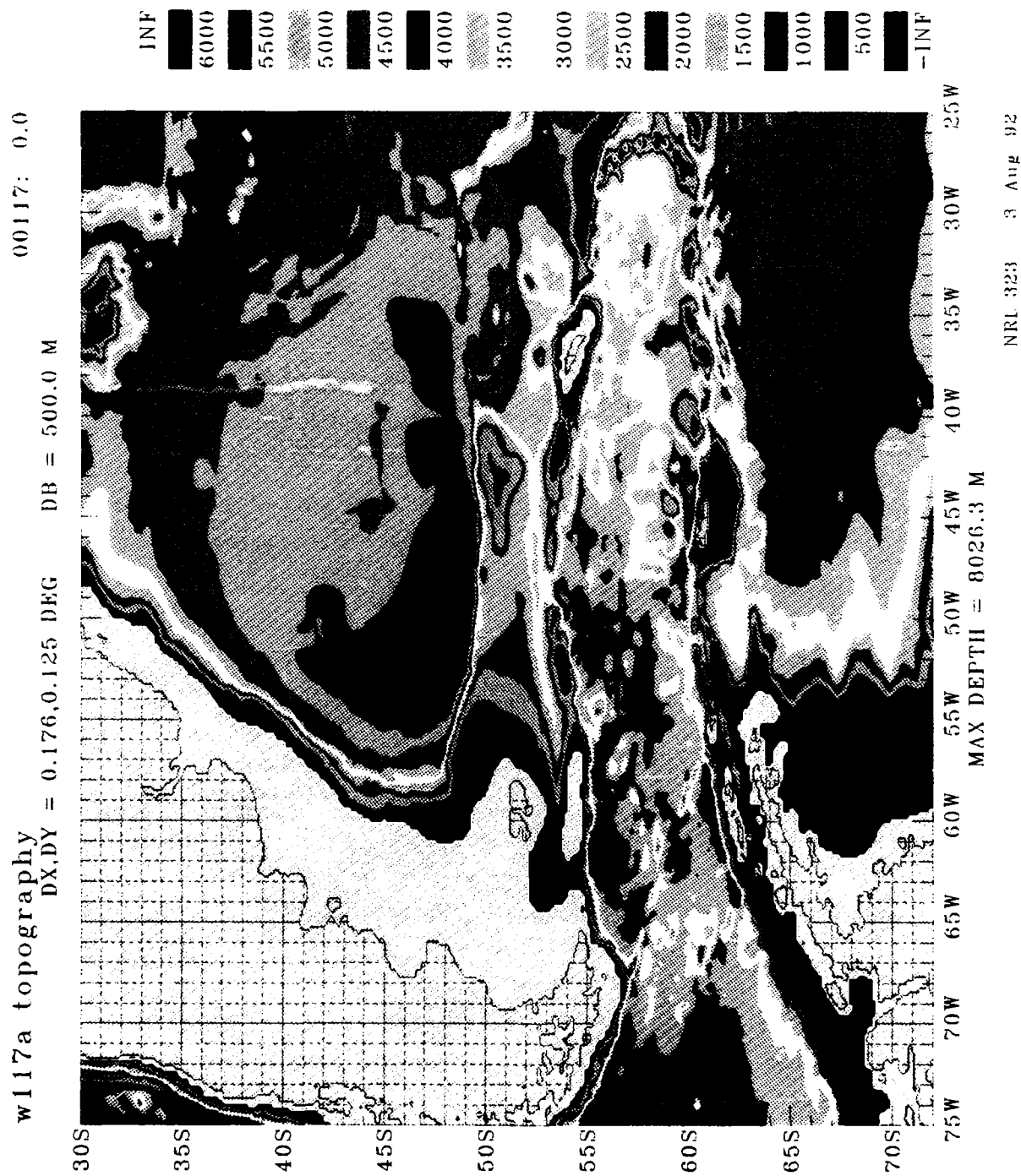


Figure 83: Plot of the Drake Passage and the Falkland Islands from the new $1/8^\circ$ global topography.

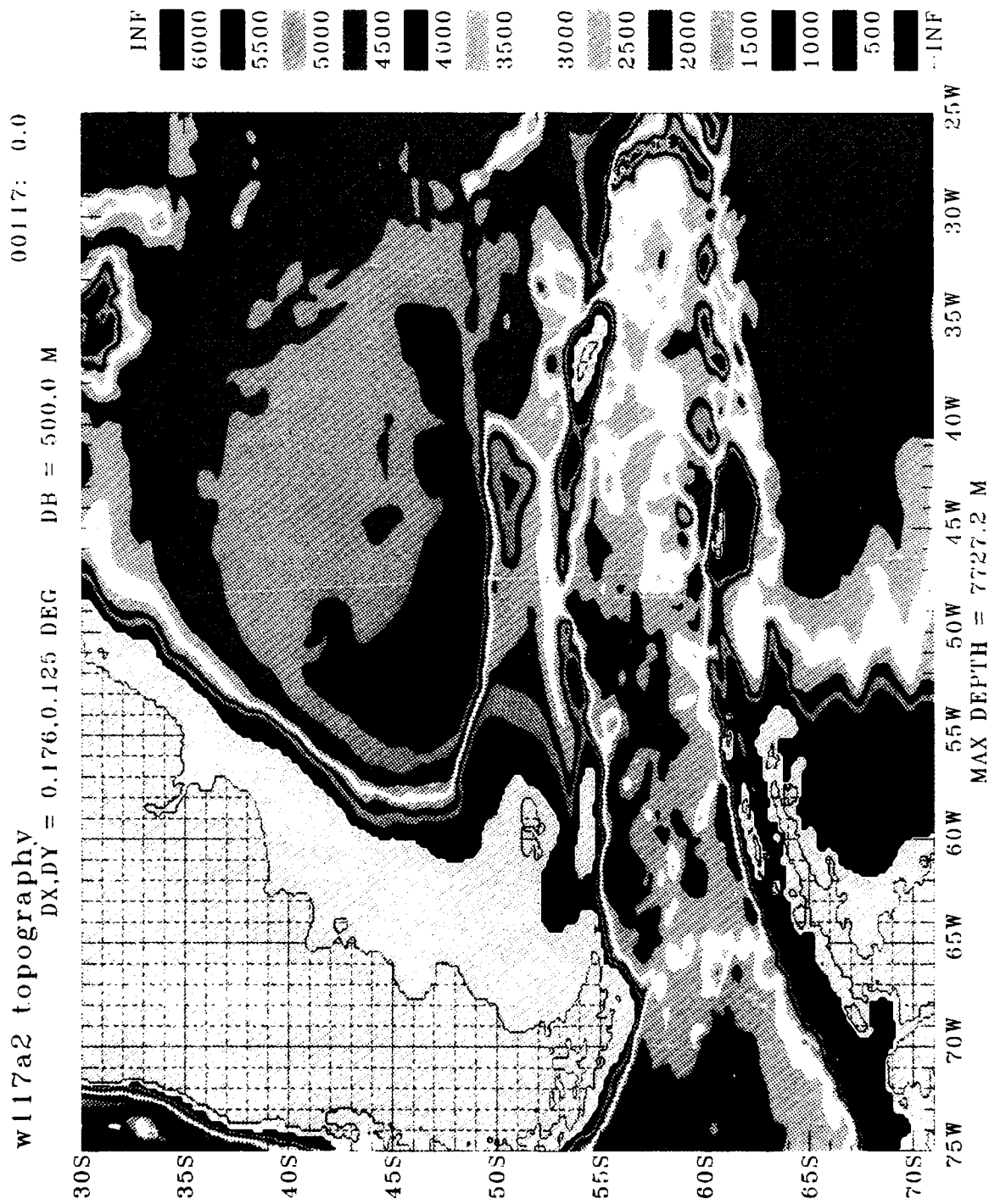


Figure 84: Plot of the Drake Passage and the Falkland Islands from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

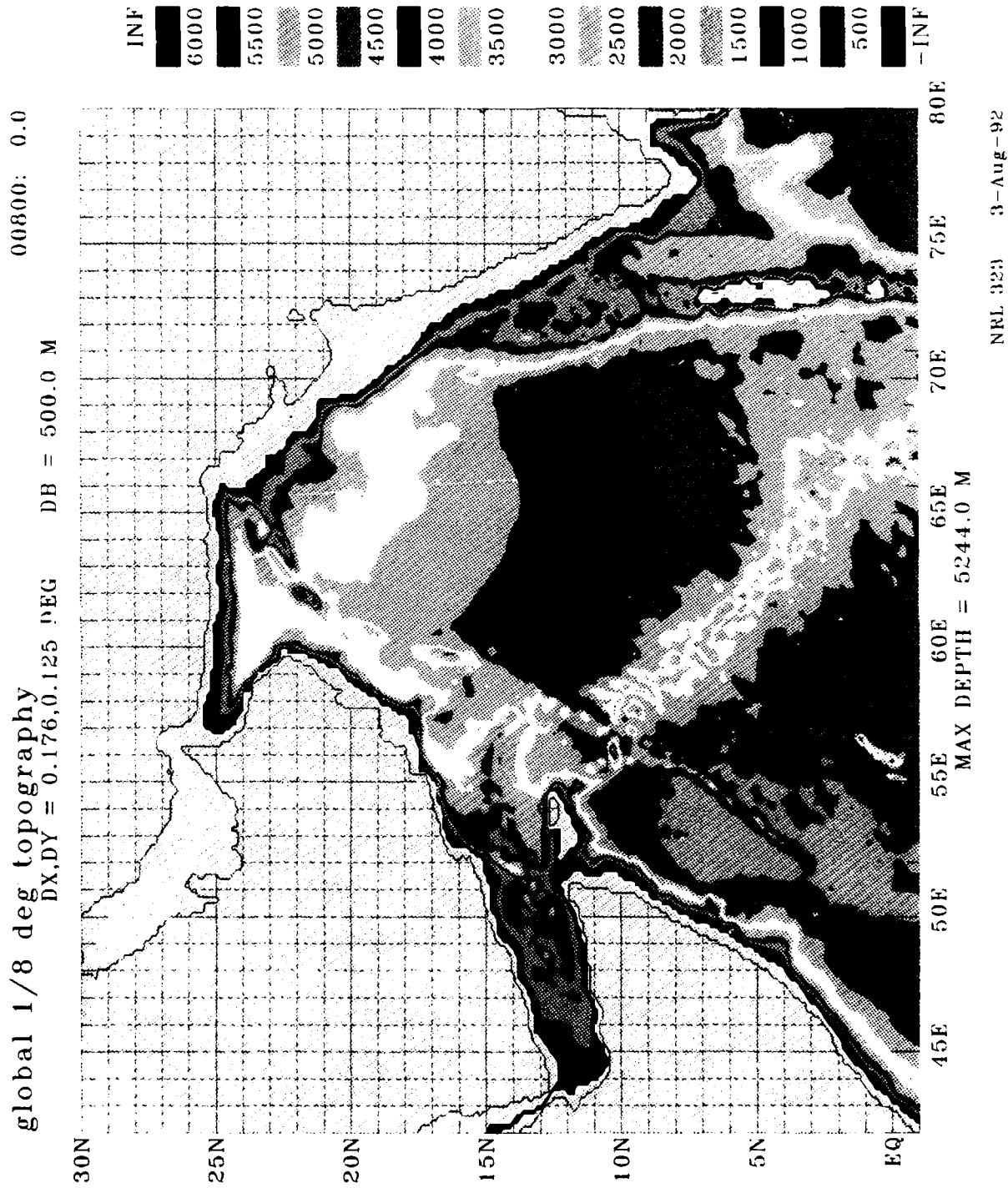
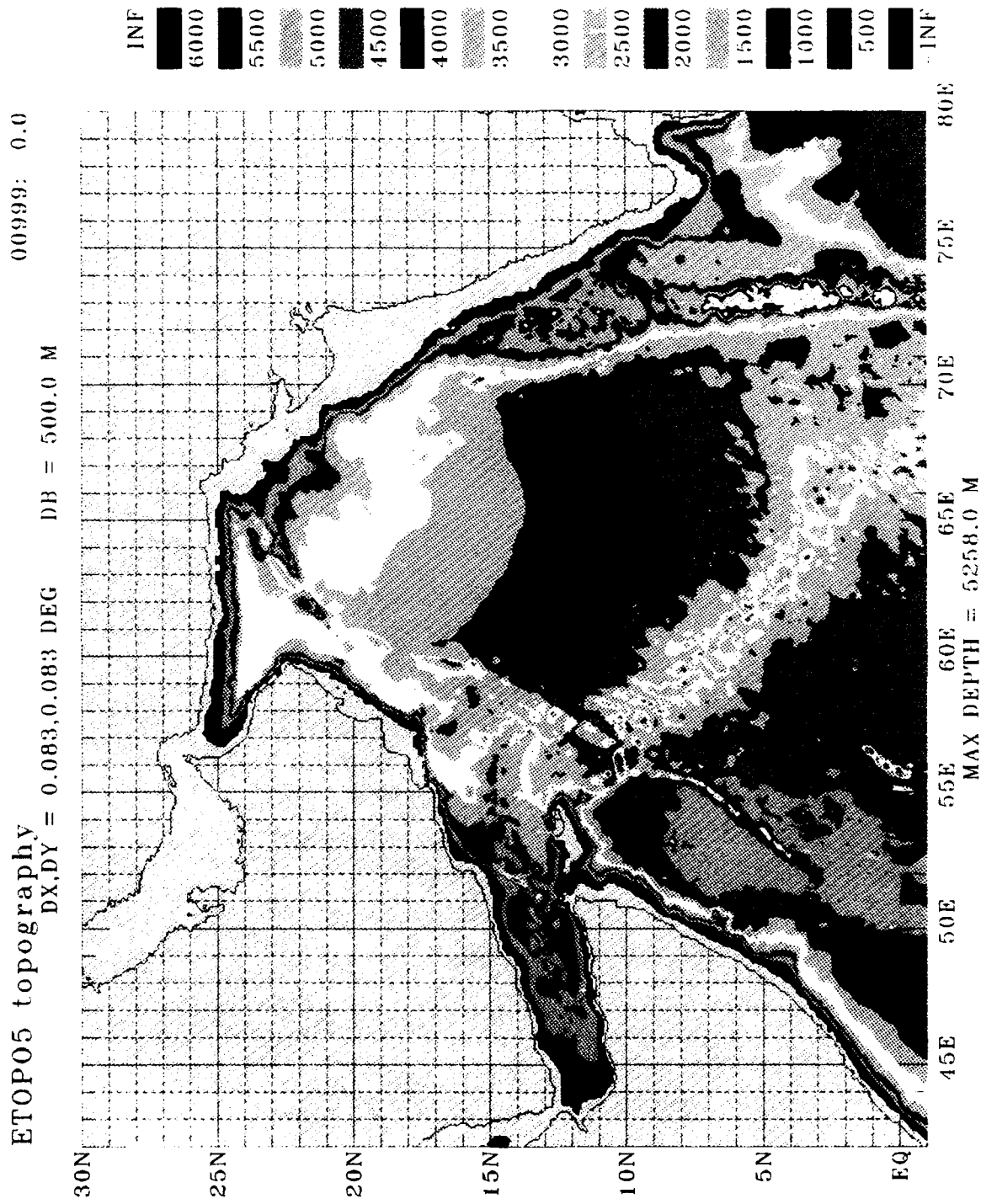


Figure 85: Plot of the Arabian Sea from the unmodified 1/8° global topography.



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Figure 86: Plot of the Arabian Sea from the 1/12° ETOP05 topography.

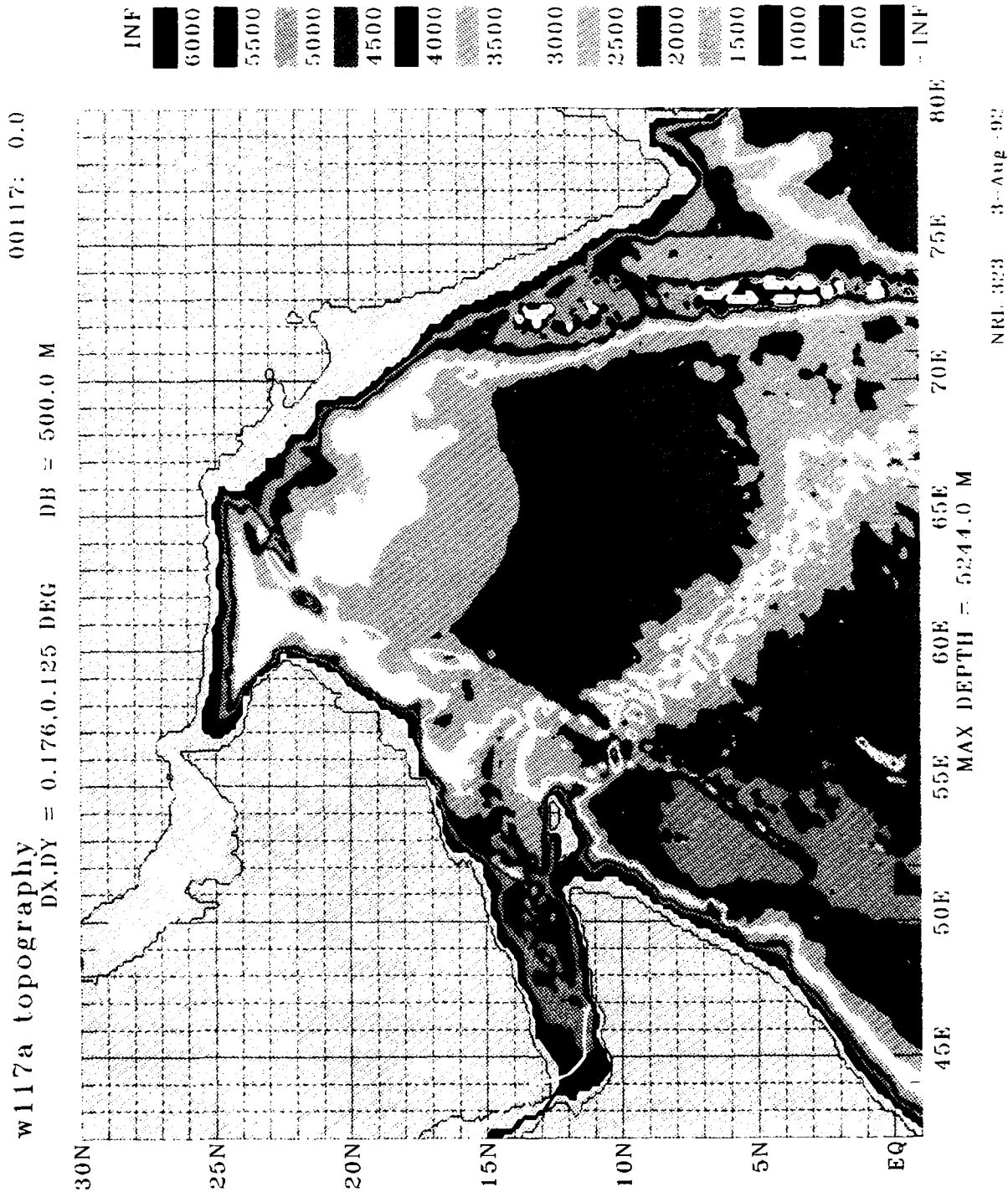


Figure 87: Plot of the Arabian Sea from the new 1/8° global topography.

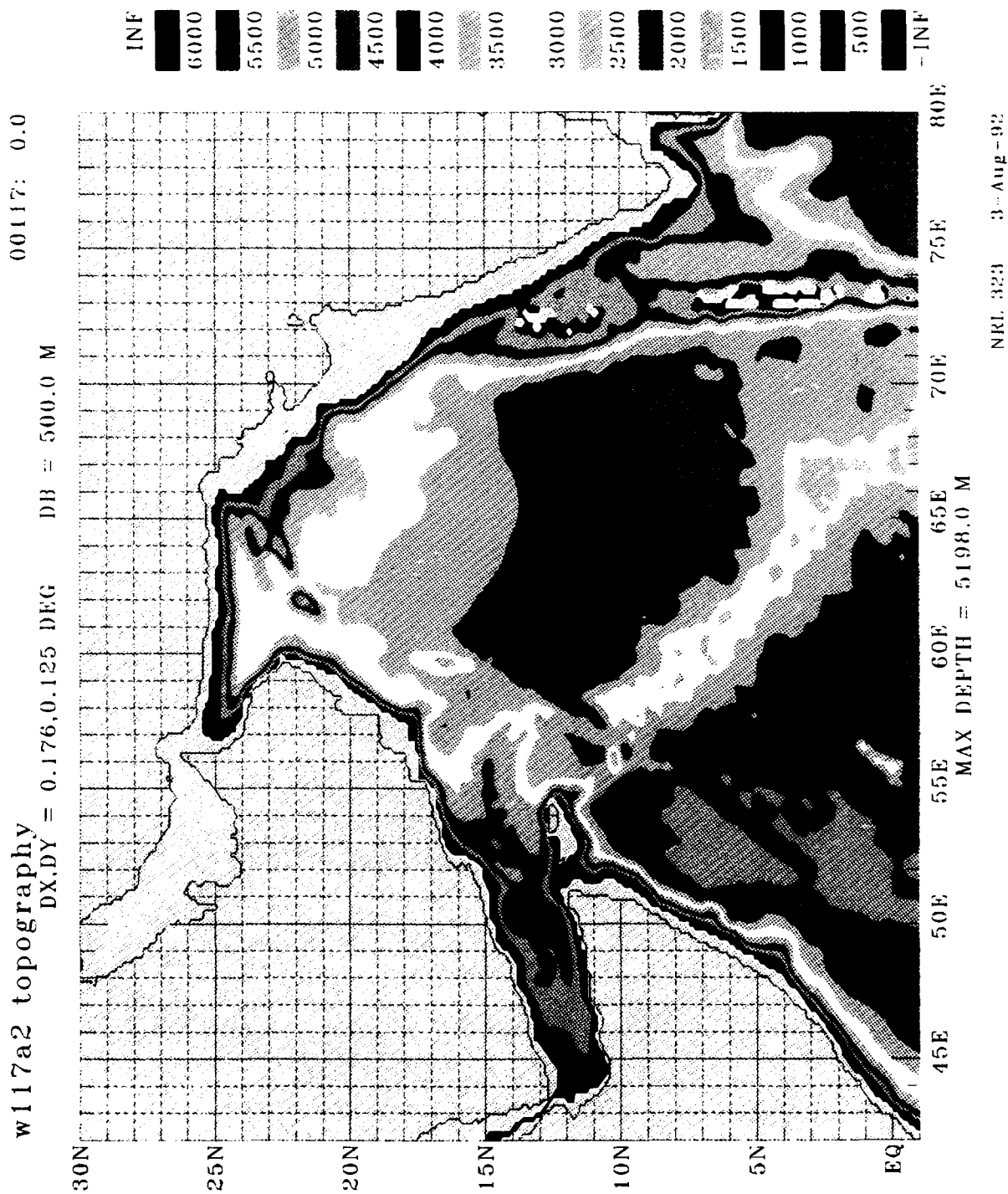


Figure 88: Plot of the Arabian Sea from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

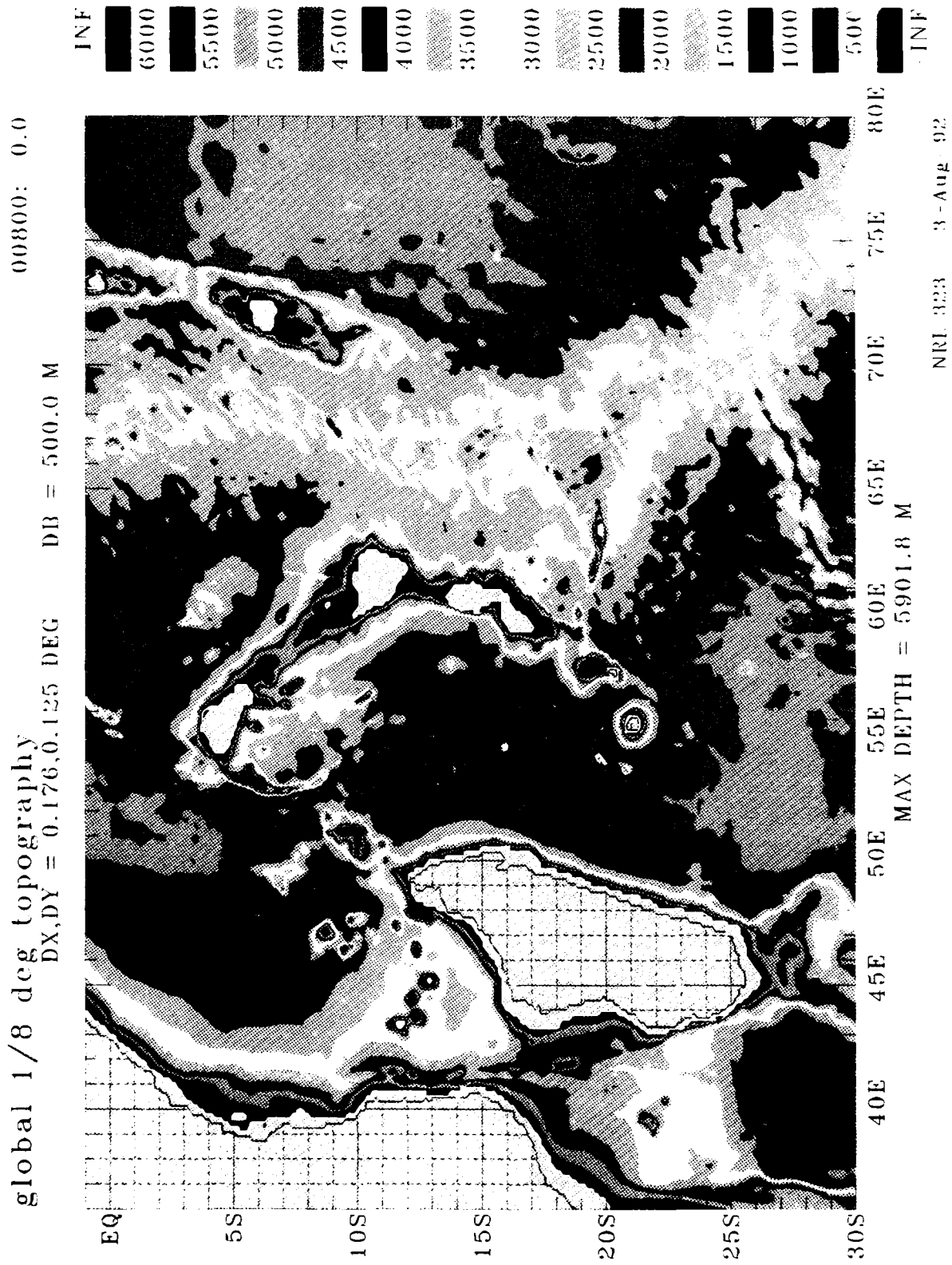


Figure 89: Plot of the Southwestern Indian Ocean from the unmodified 1/8° global topography.

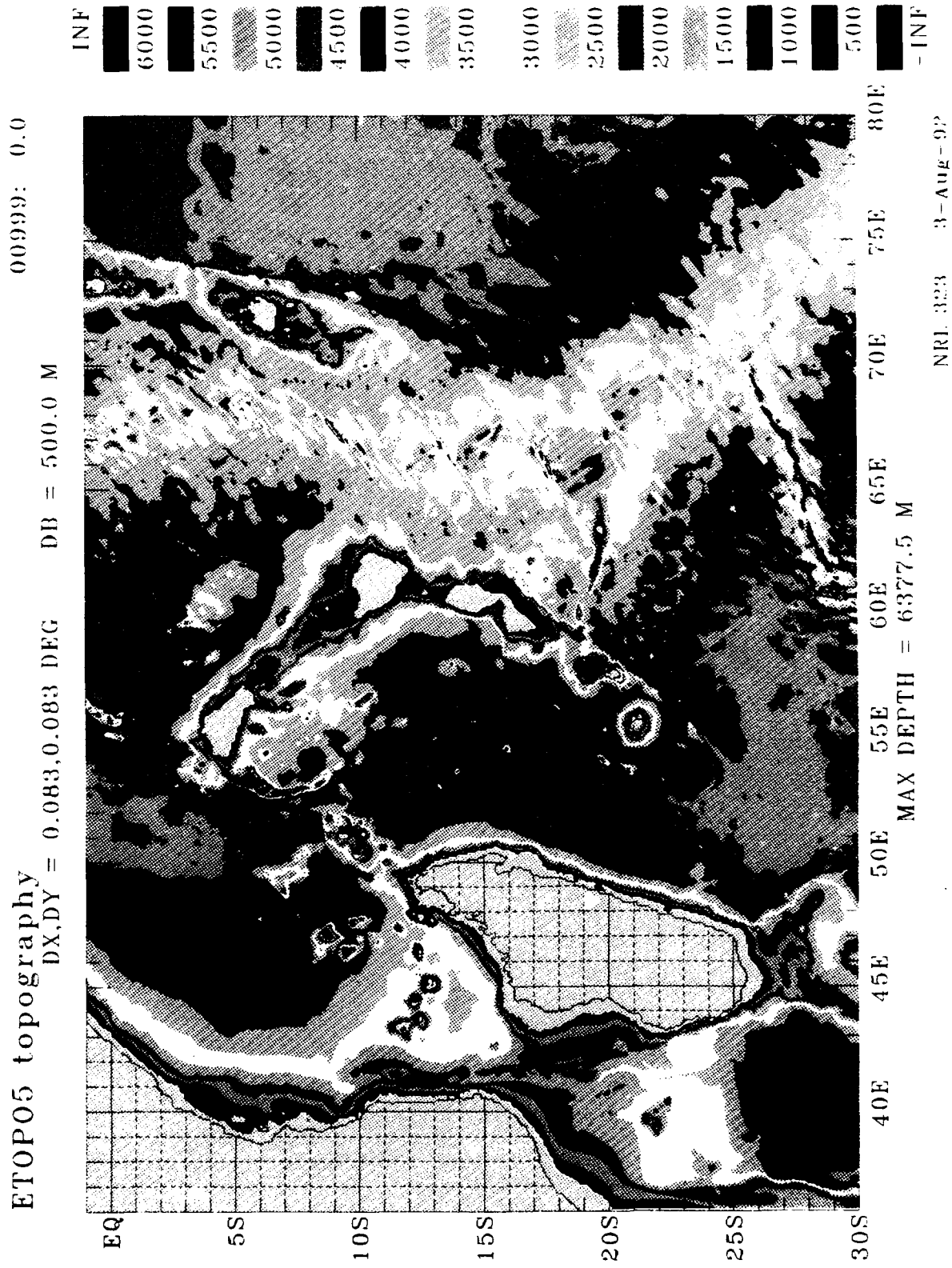


Figure 90: Plot of the Southwestern Indian Ocean from the 1/12° ETOP05 topography.

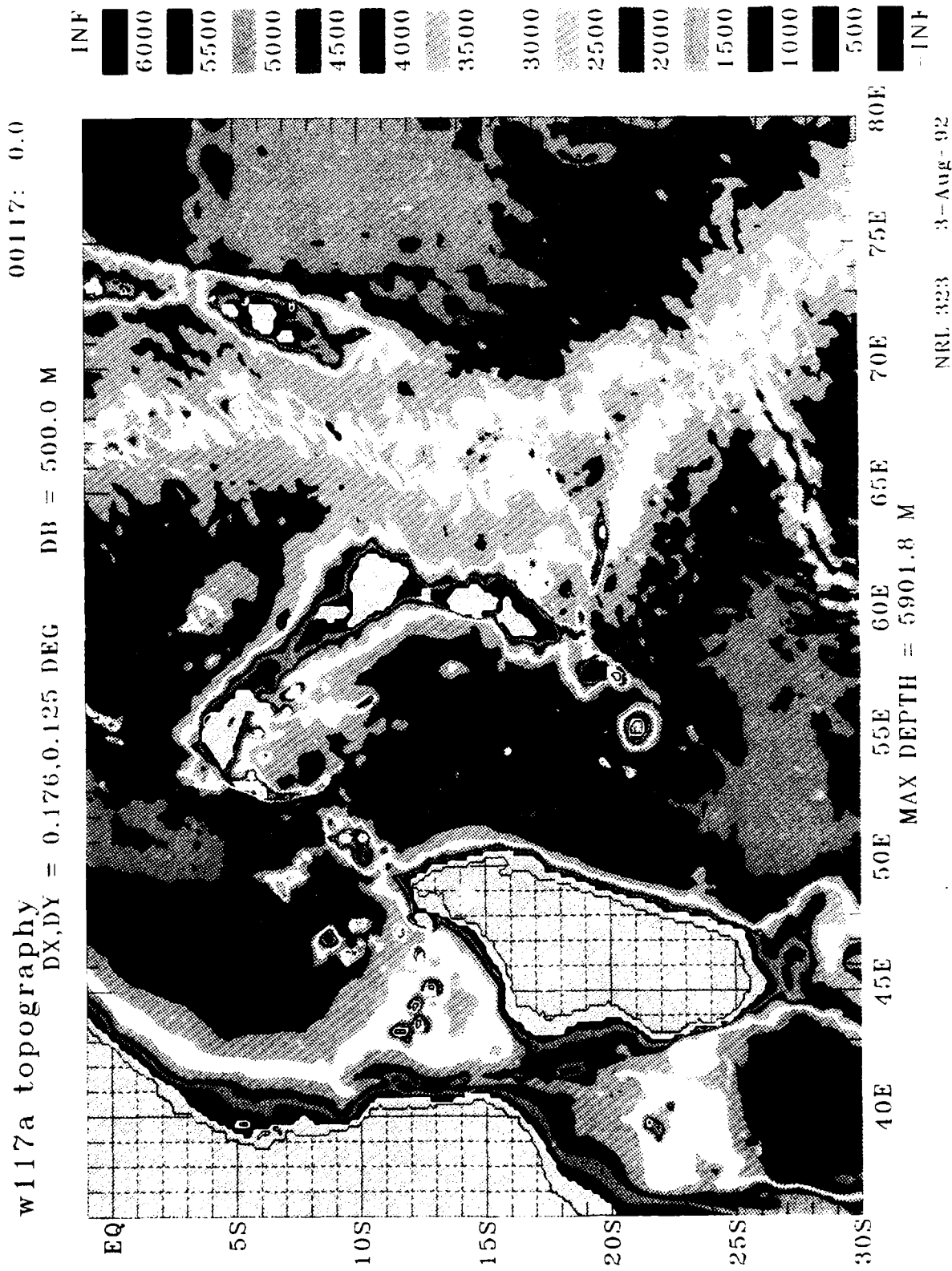


Figure 91: Plot of the Southwestern Indian Ocean from the new $1/8^\circ$ global topography.

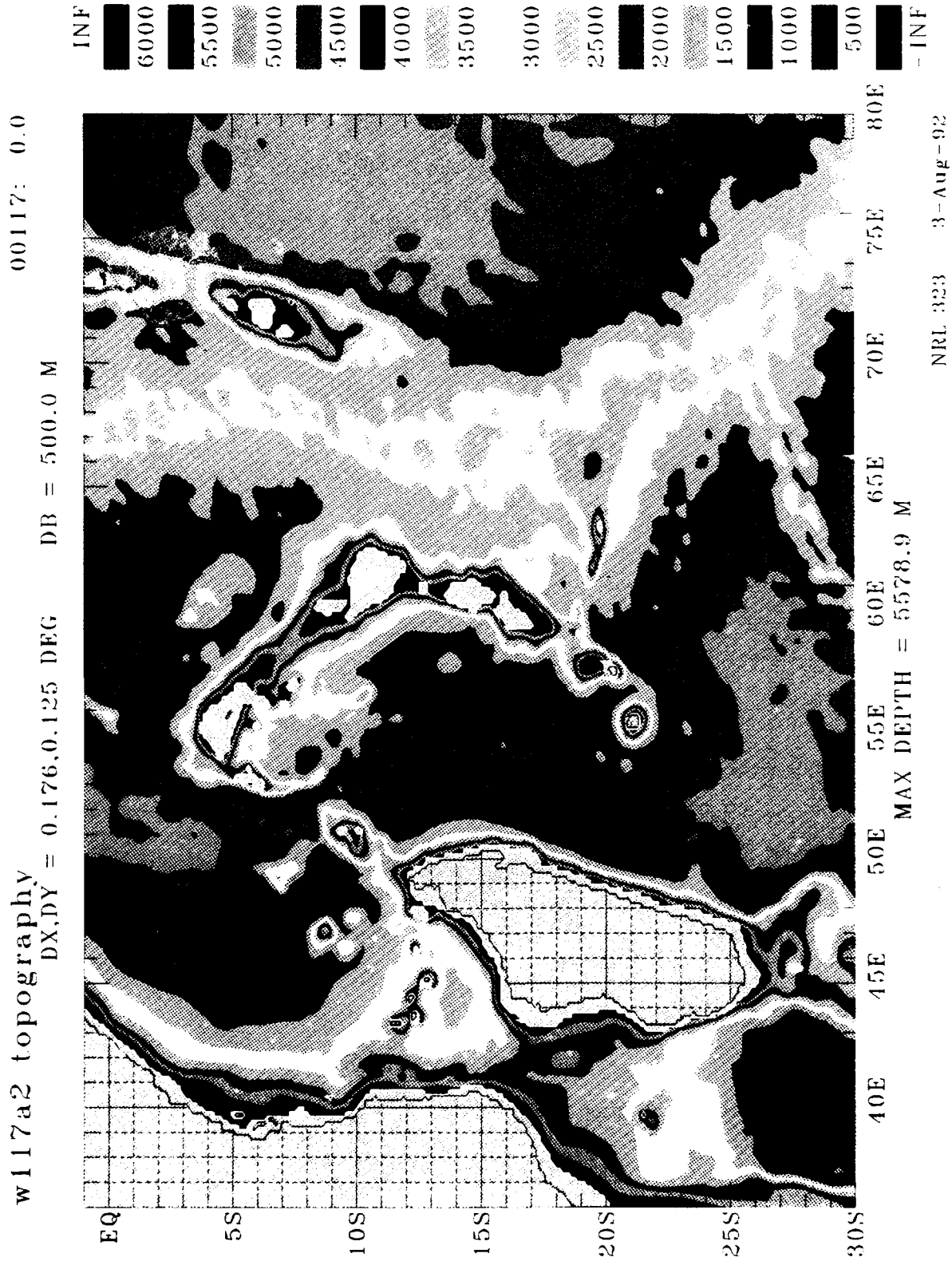


Figure 92: Plot of the Southwestern Indian Ocean from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

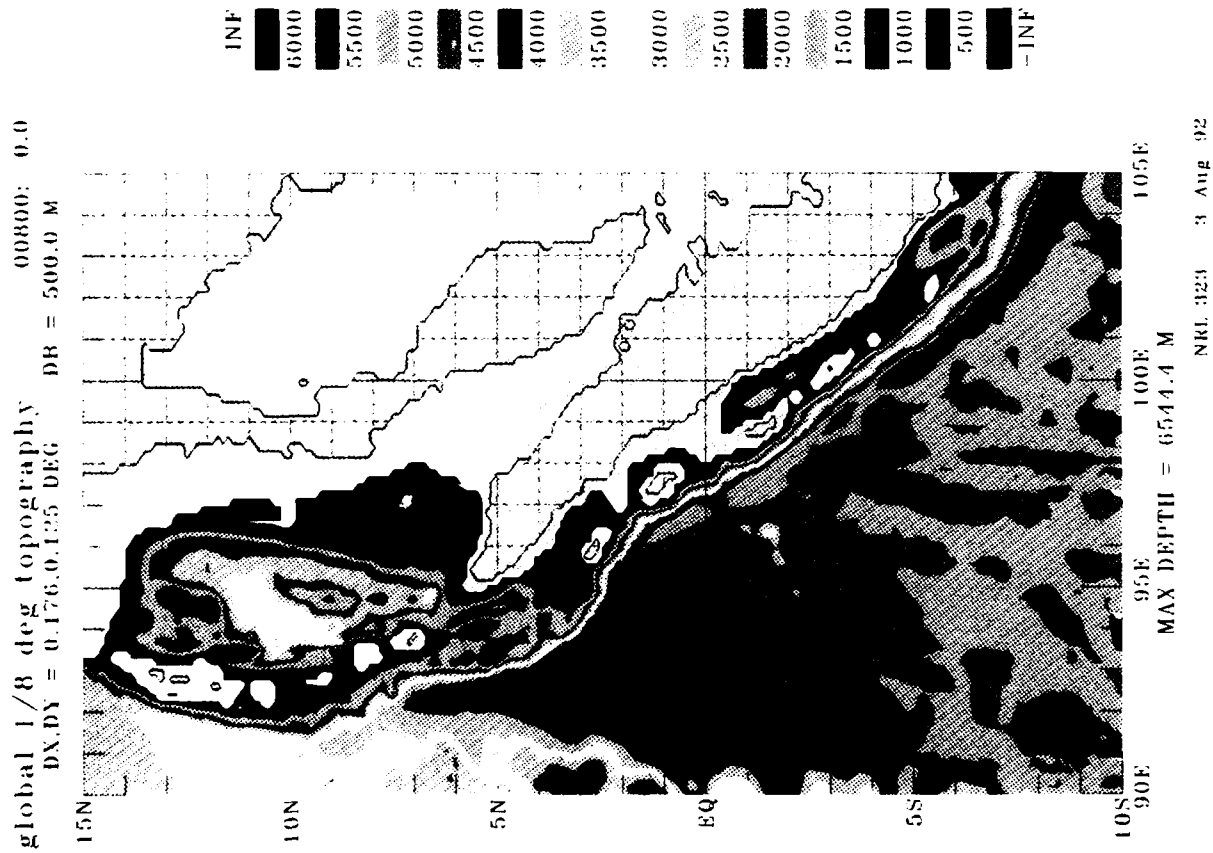


Figure 93: Plot of the Andaman Sea from the unmodified 1/8° global topography.

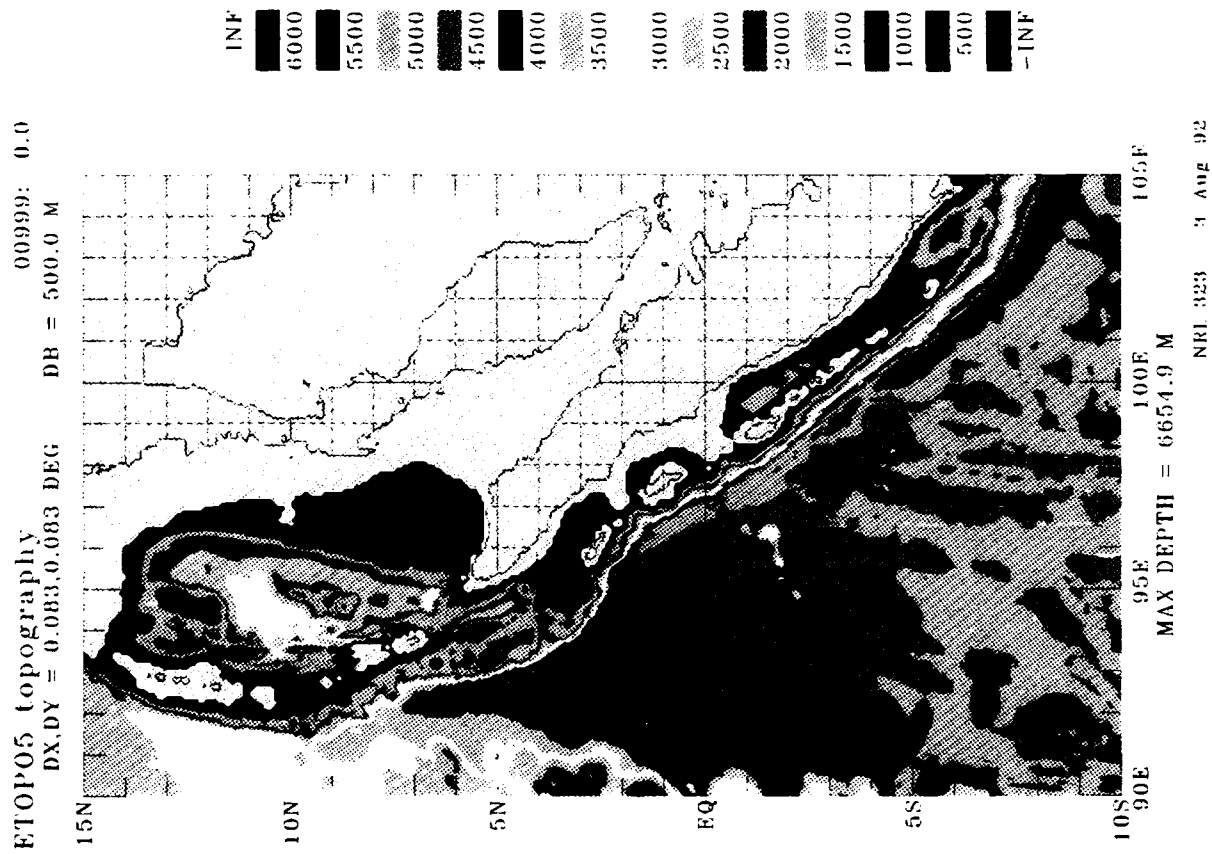


Figure 94: Plot of the Andaman Sea from the 1/12° ETOPO5 topography.

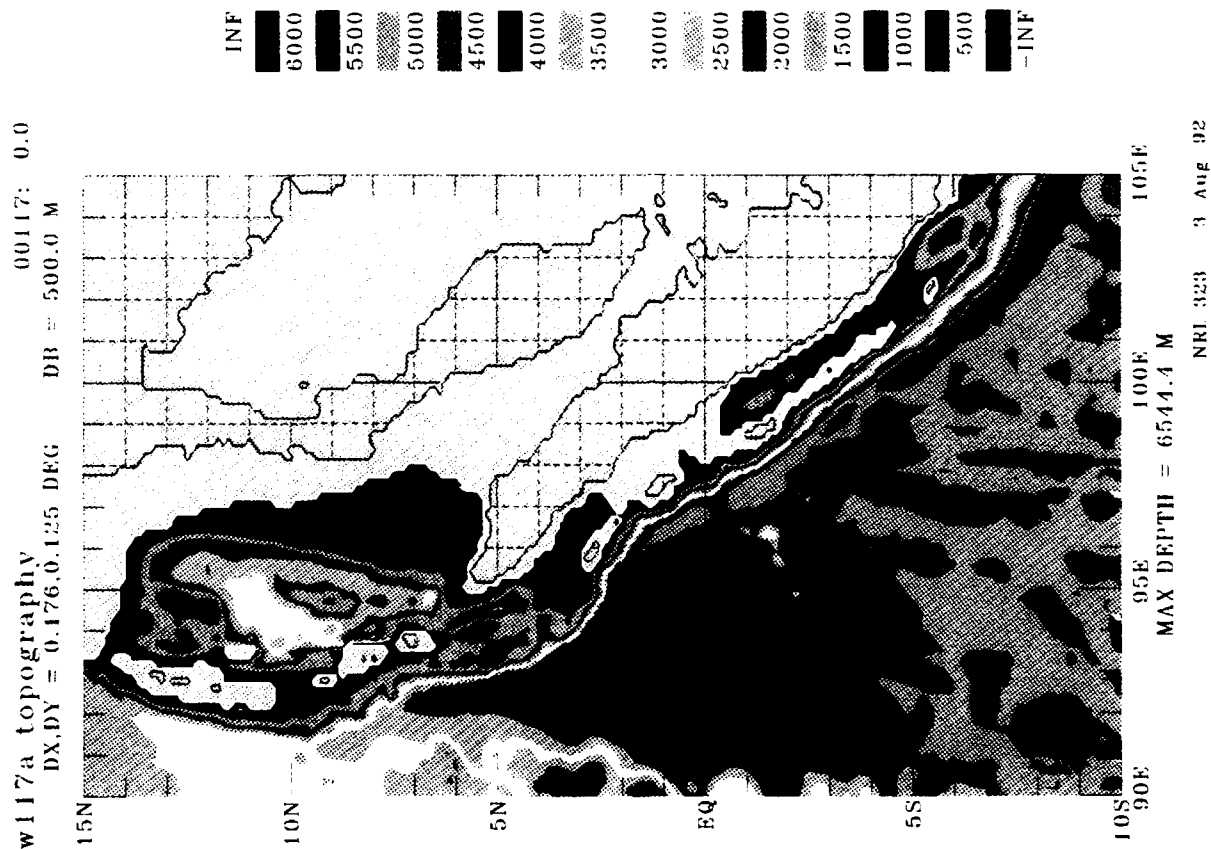


Figure 95: Plot of the Andaman Sea from the new $1/8^\circ$ global topography.

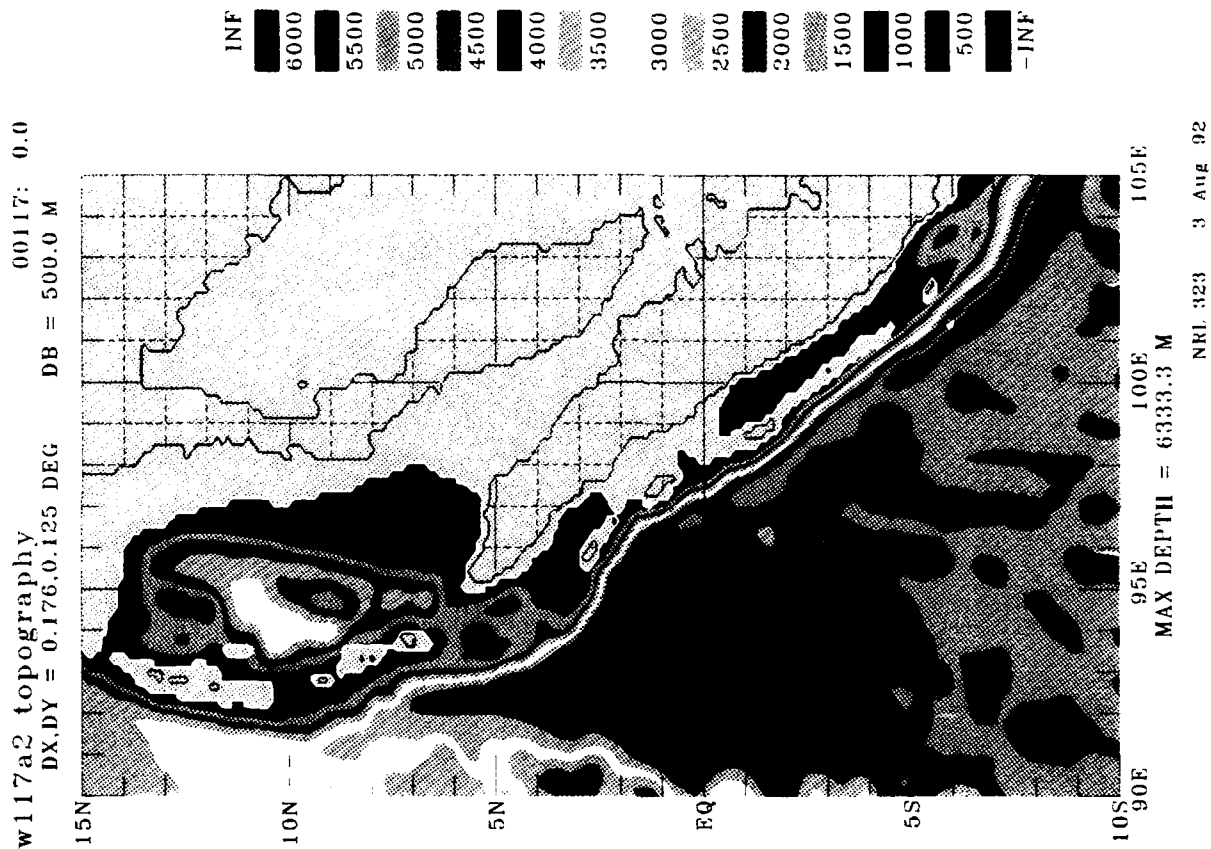


Figure 96: Plot of the Andaman Sea from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

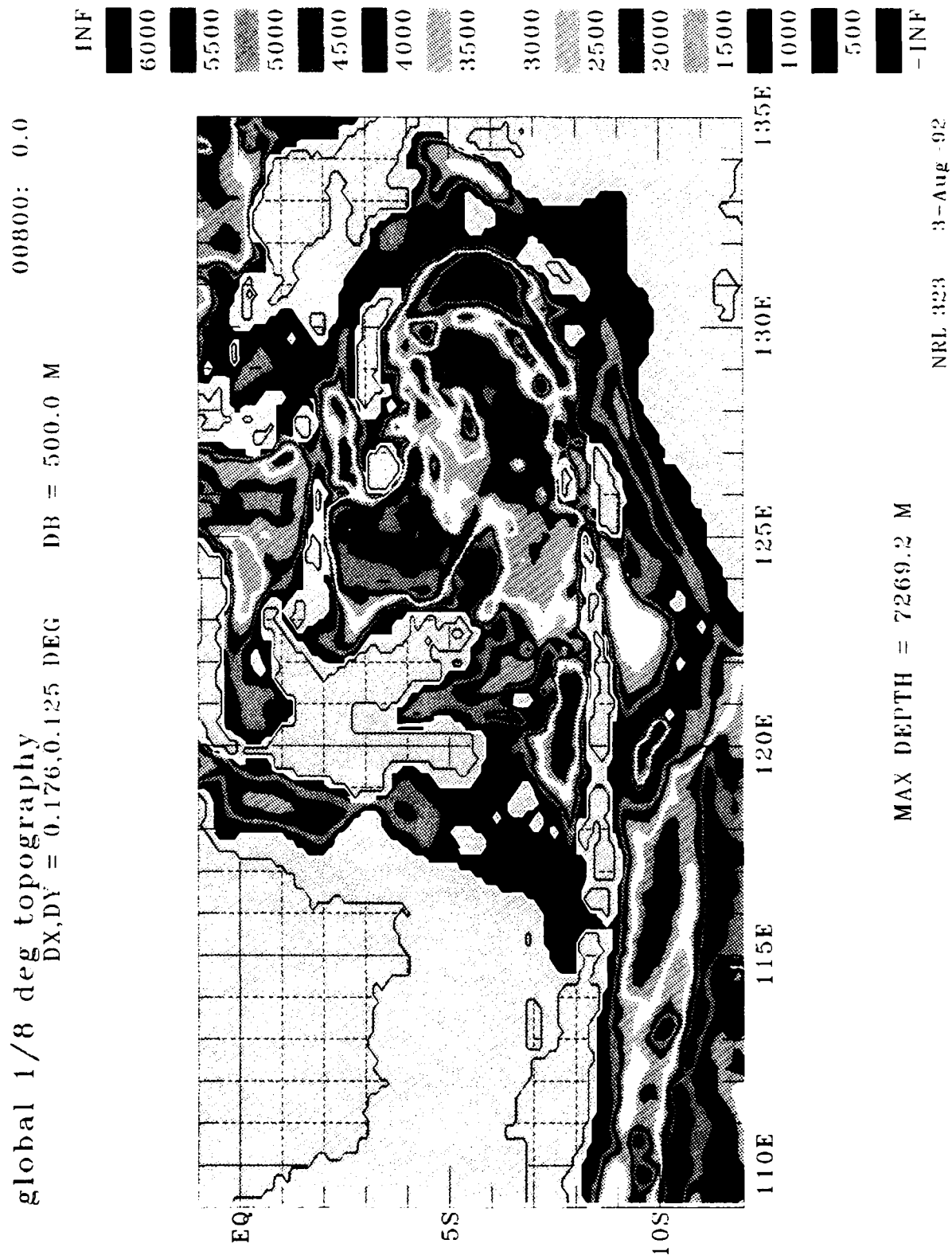


Figure 97: Plot of the Indonesian Throughflow region from the unmodified 1/8° global topography.

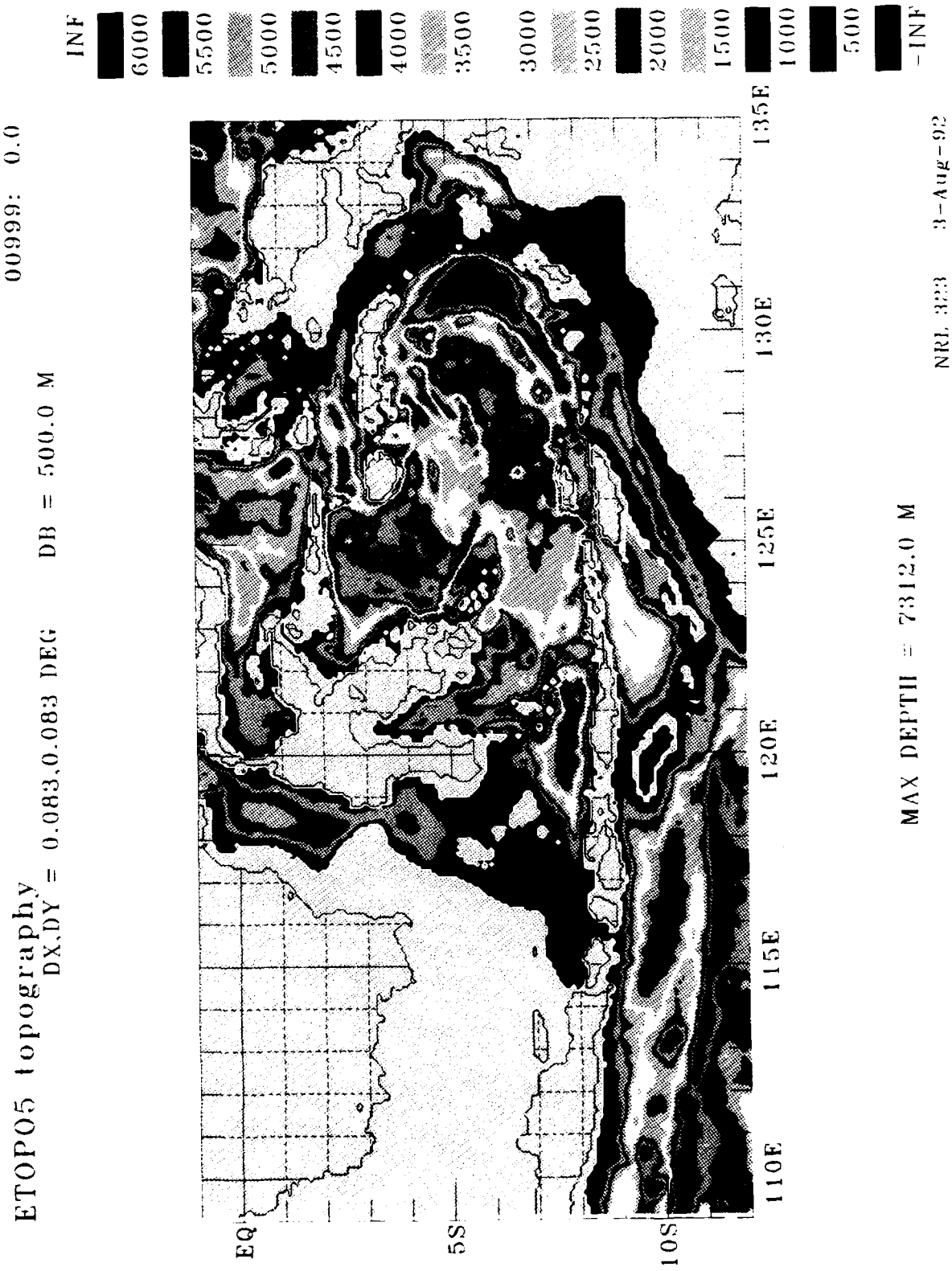


Figure 98: Plot of the Indonesian Throughflow region from the 1/12° ETOPO5 topography.

w117a topography
 DX,DY = 0.176,0.125 DEG DB = 500.0 M 00117:***.4

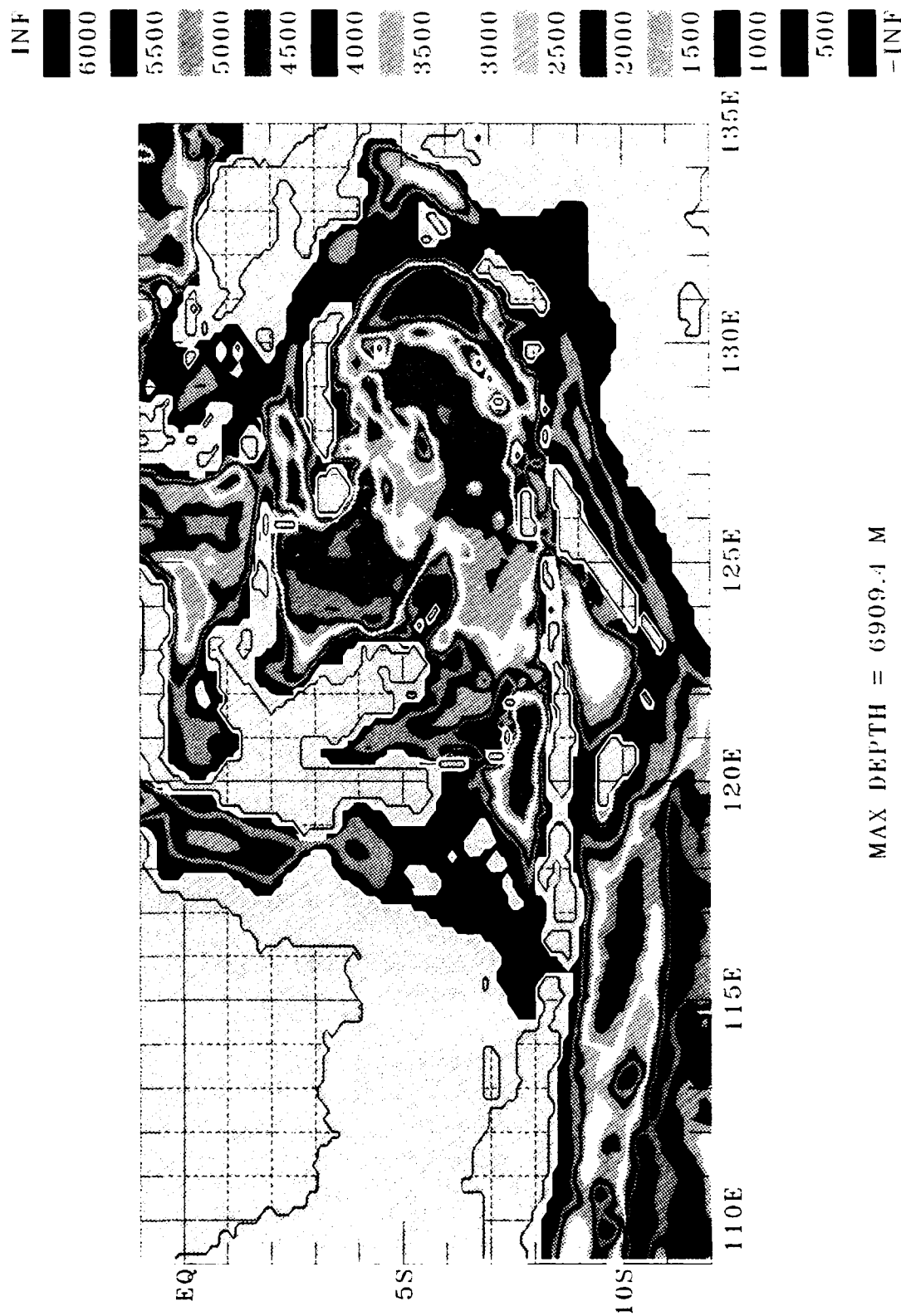
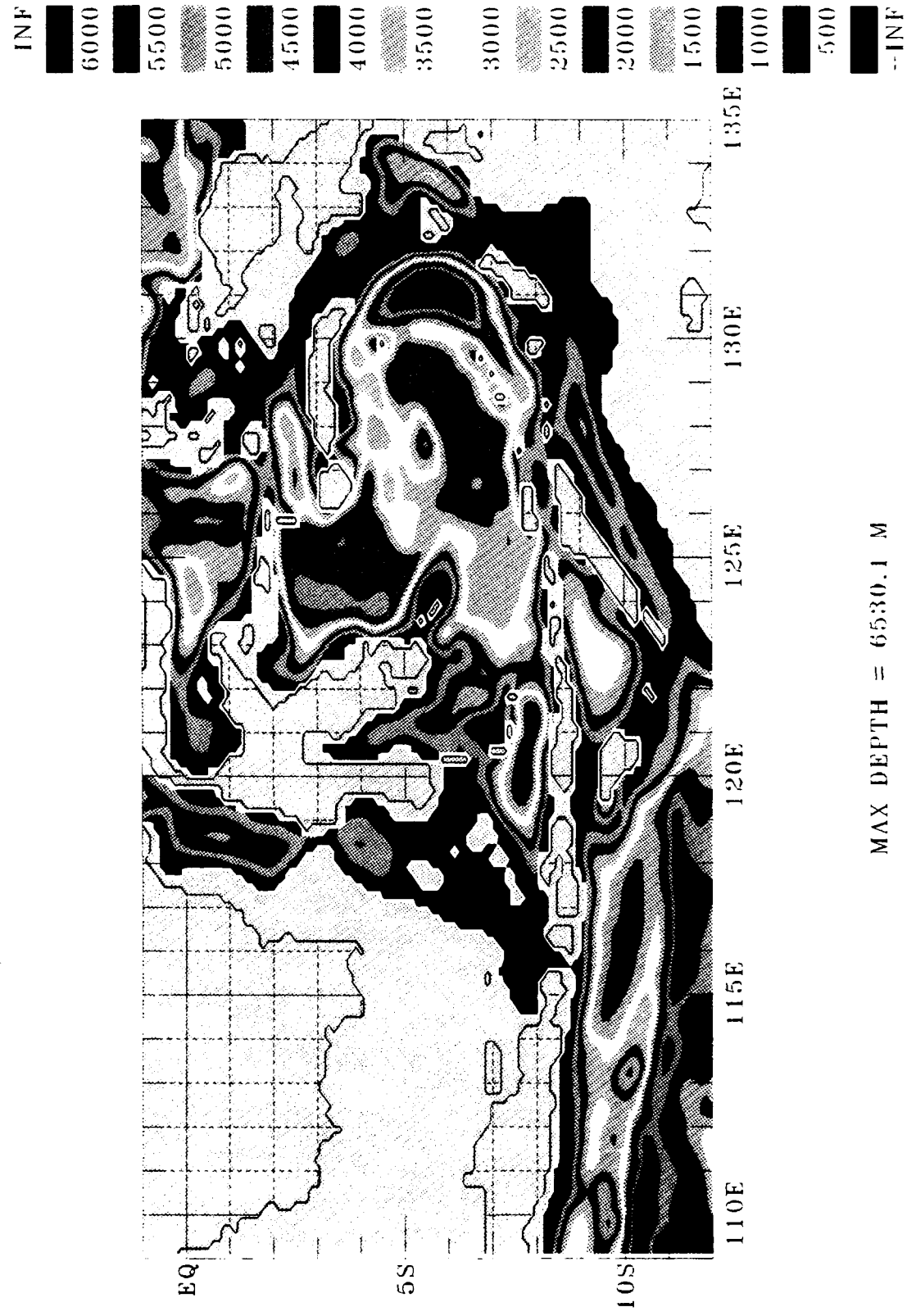


Figure 99: Plot of the Indonesian Throughflow region from the new 1/8° global topography.

w117a2 topography

00117:***.4

DX,DY = 0.176,0.125 DEG DB = 500.0 M



MAX DEPTH = 6530.1 M

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Figure 100: Plot of the Indonesian Throughflow region from the new 1/8° global topography which has been smoothed by two passes of a 9-point smoother.

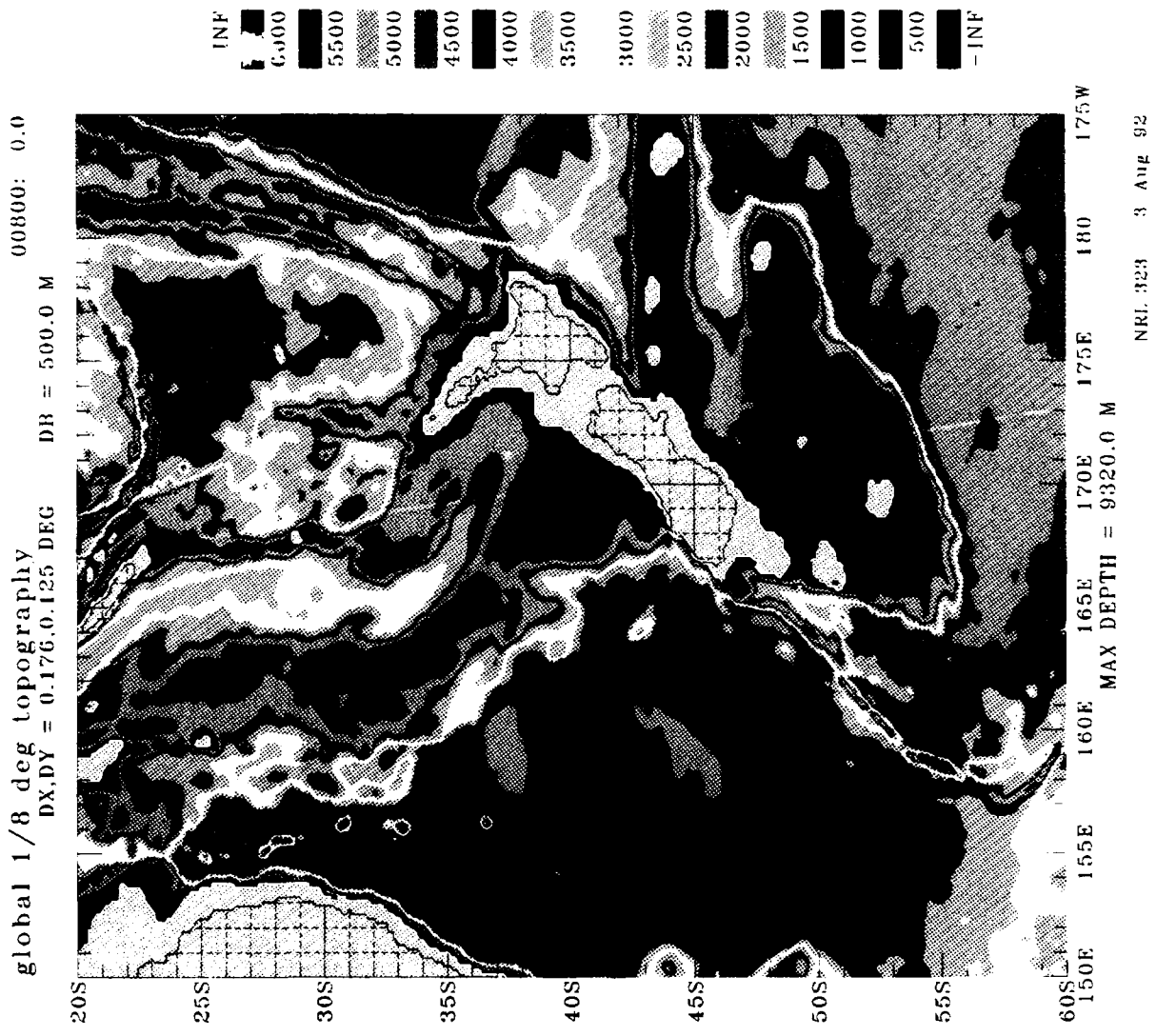


Figure 101: Plot of New Zealand from the unmodified 1/8° global topography.

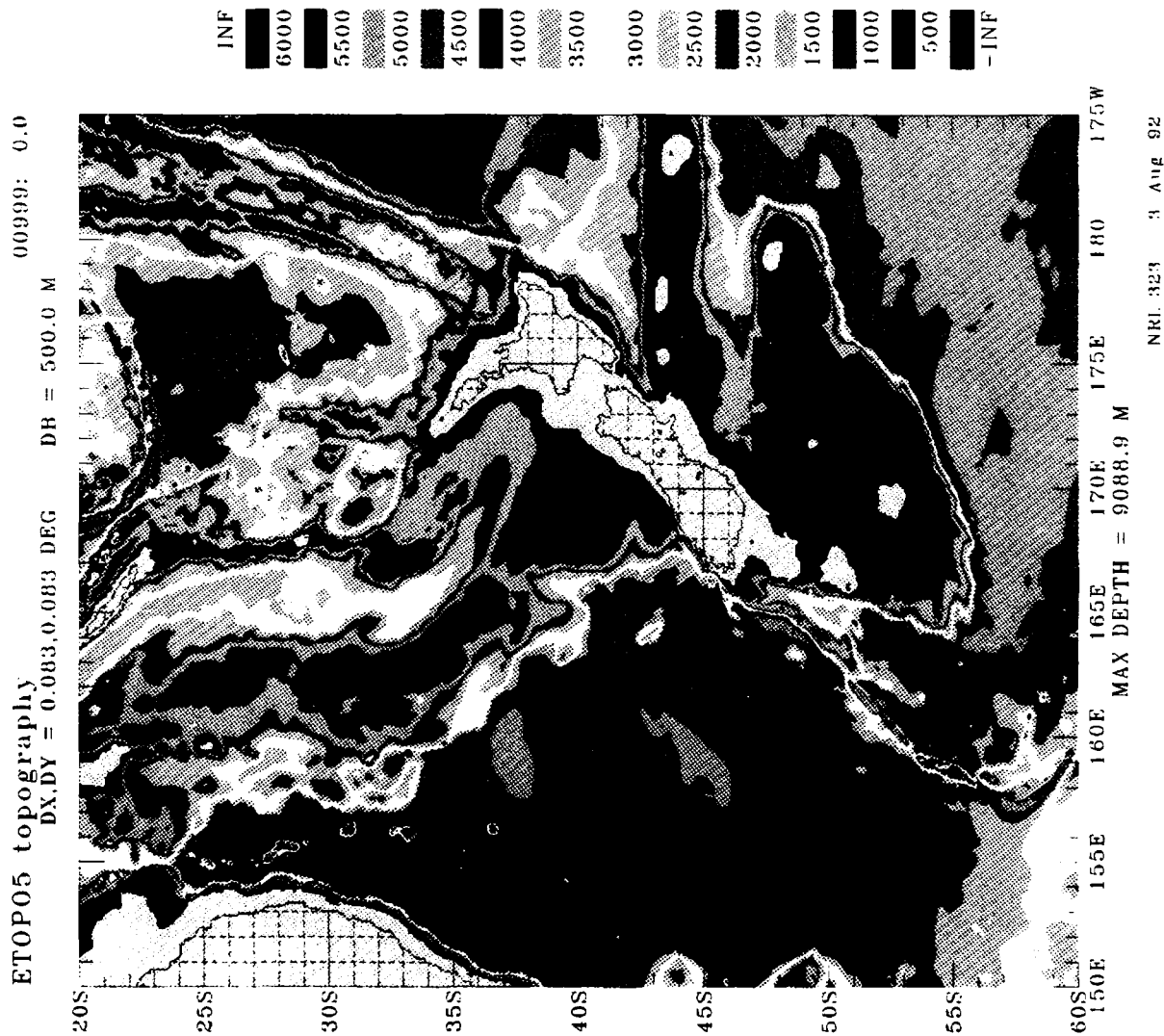
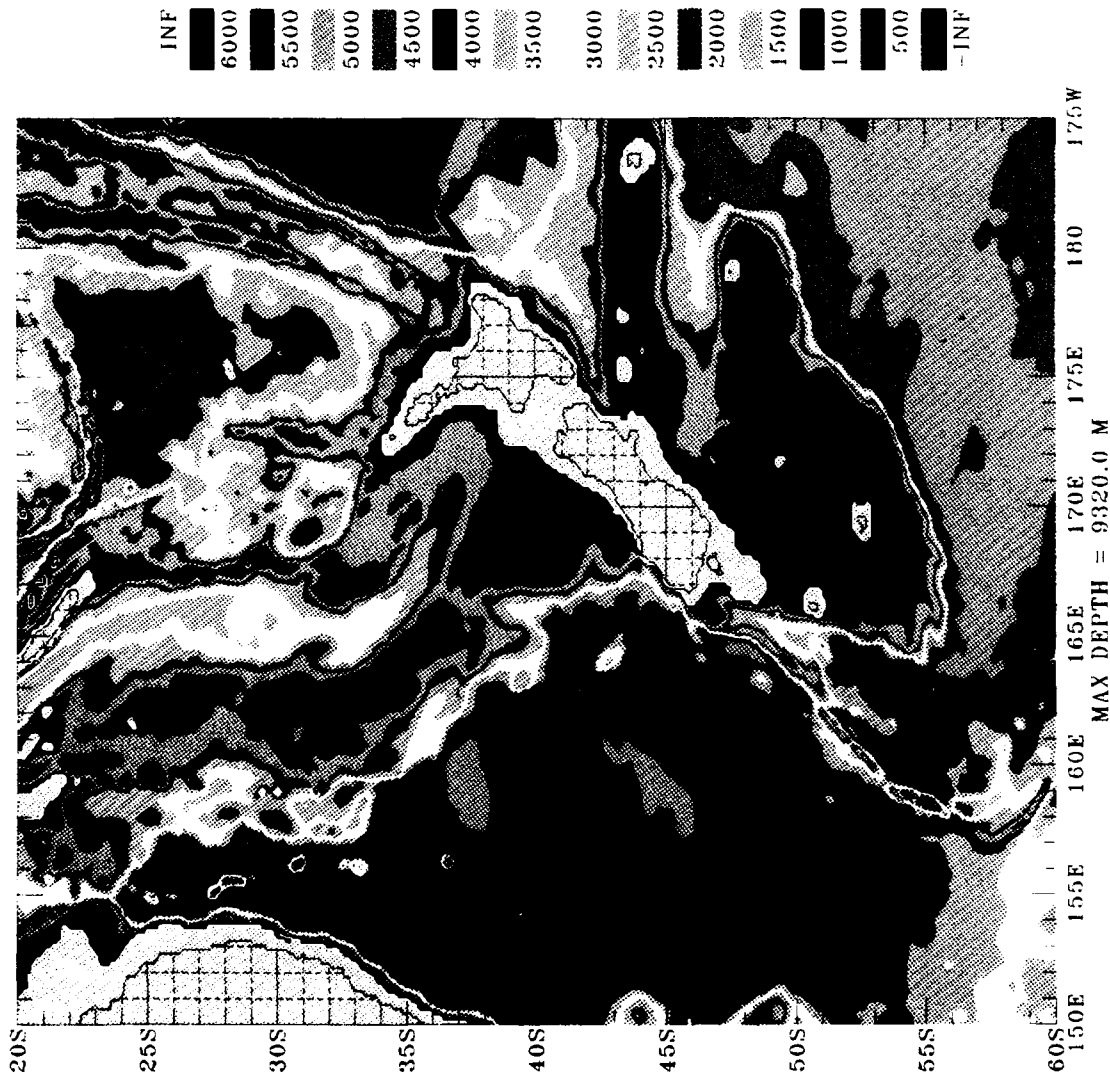


Figure 102: Plot of New Zealand from the 1/12° ETOPO5 topography.

w117a topography
 DX,DY = 0.176,0.125 DEG DB = 500.0 M 00117: 0.0



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Figure 103: Plot of New Zealand from the new 1/8° global topography.

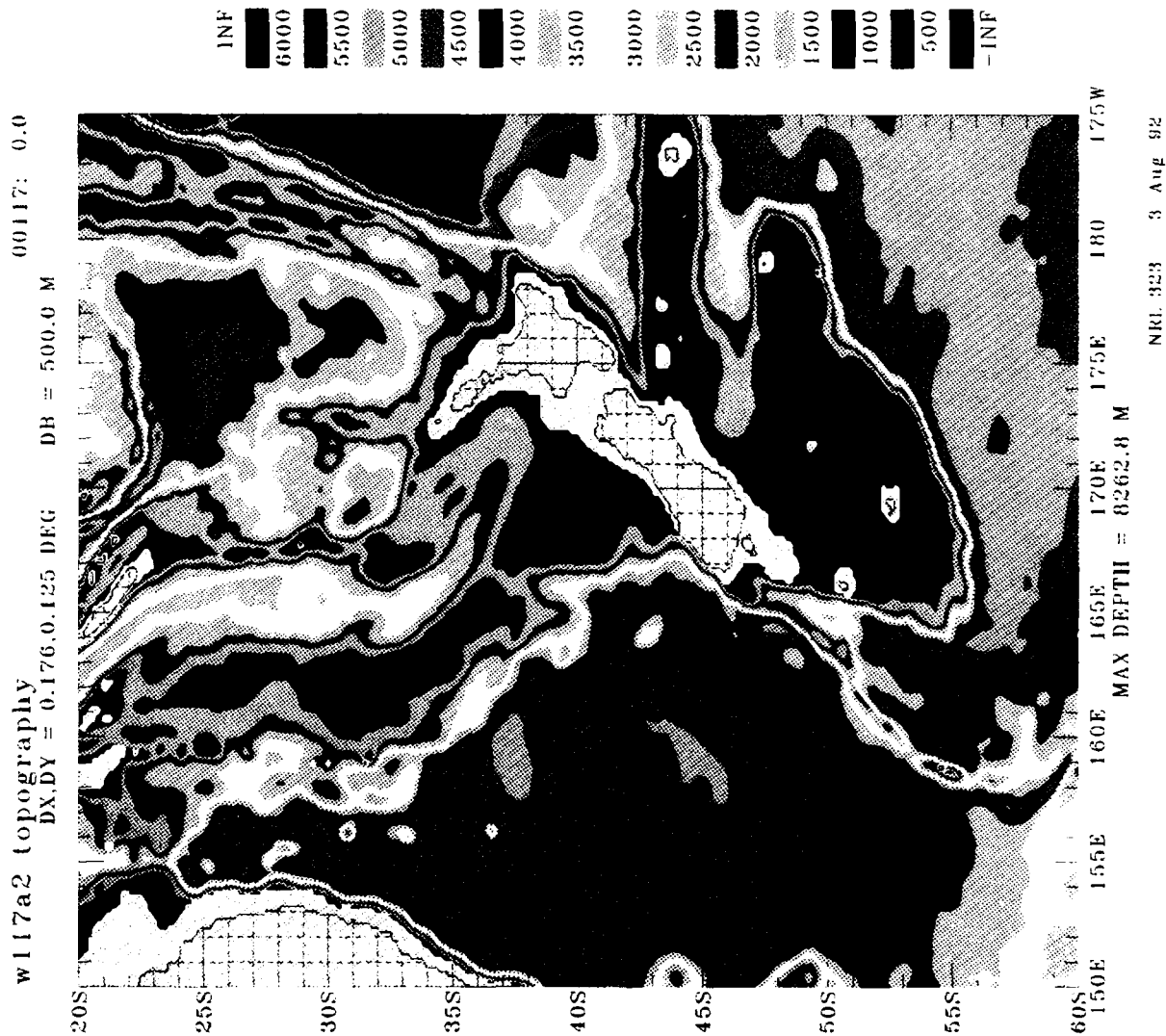
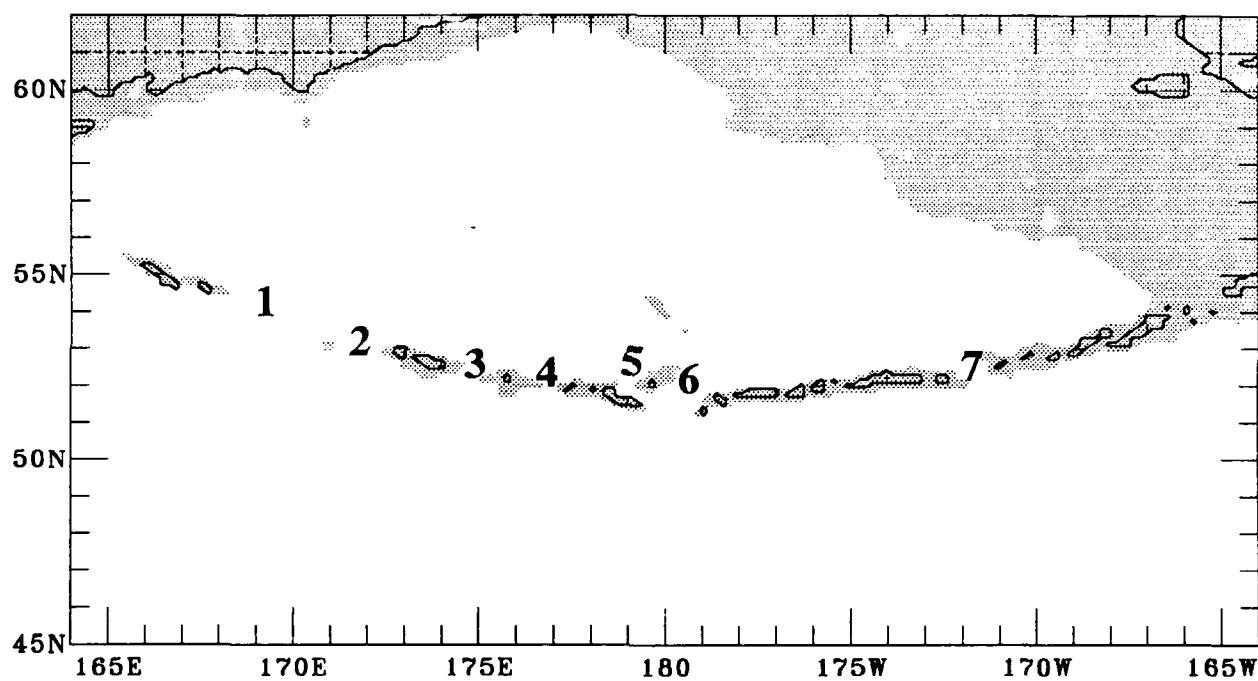


Figure 104: Plot of New Zealand from the new $1/8^\circ$ global topography which has been smoothed by two passes of a 9-point smoother.

Aleutian Islands

DX,DY = 0.176,0.125 DEG CB = 0.0 M



MAX DEPTH = 6500.0 M

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Figure 105: Plot of Aleutian Island sill depth locations listed in table 1.

Southwest Pacific Ocean

DX,DY = 0.176,0.125 DEG

DB = 0.0 M

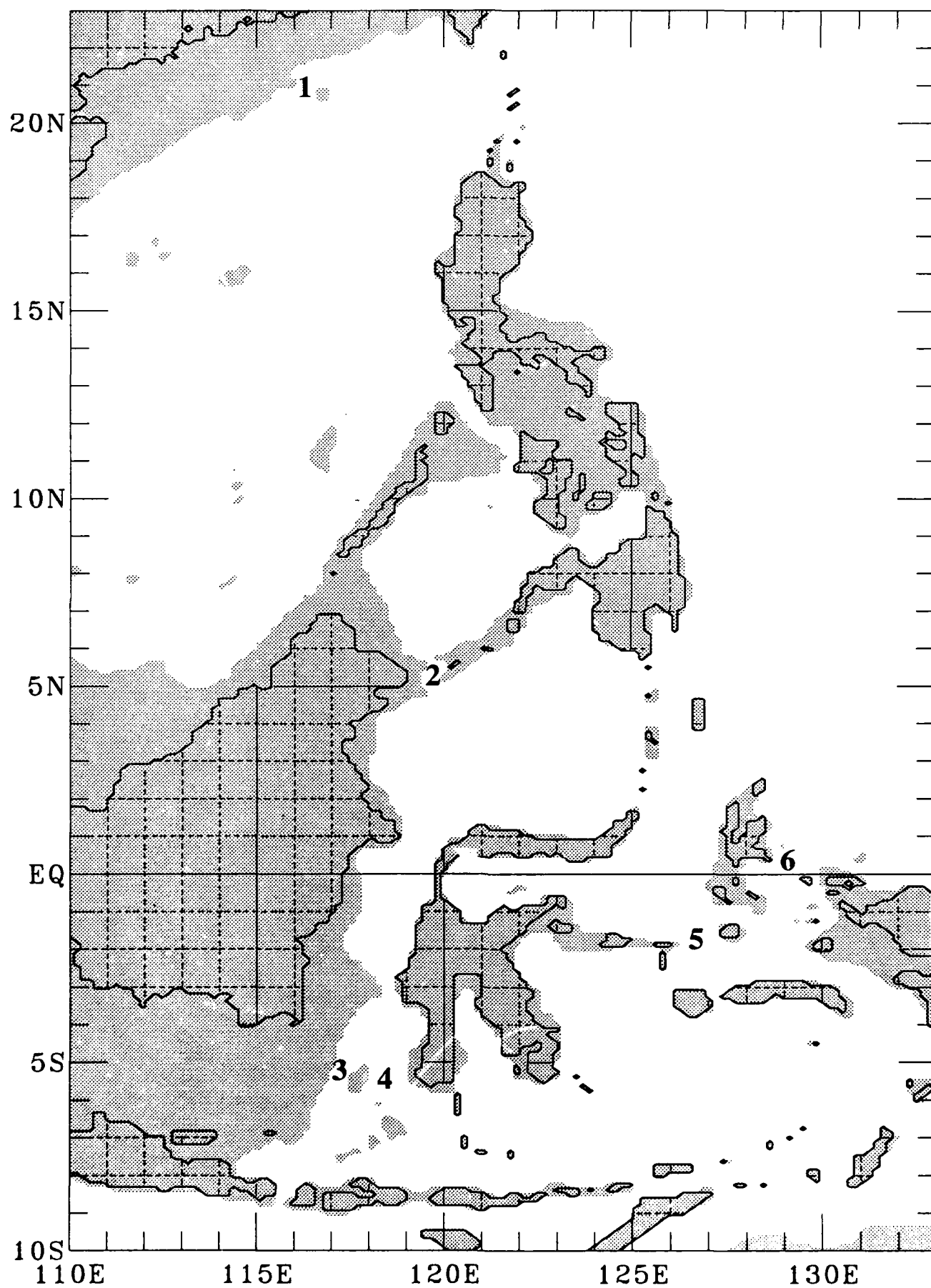
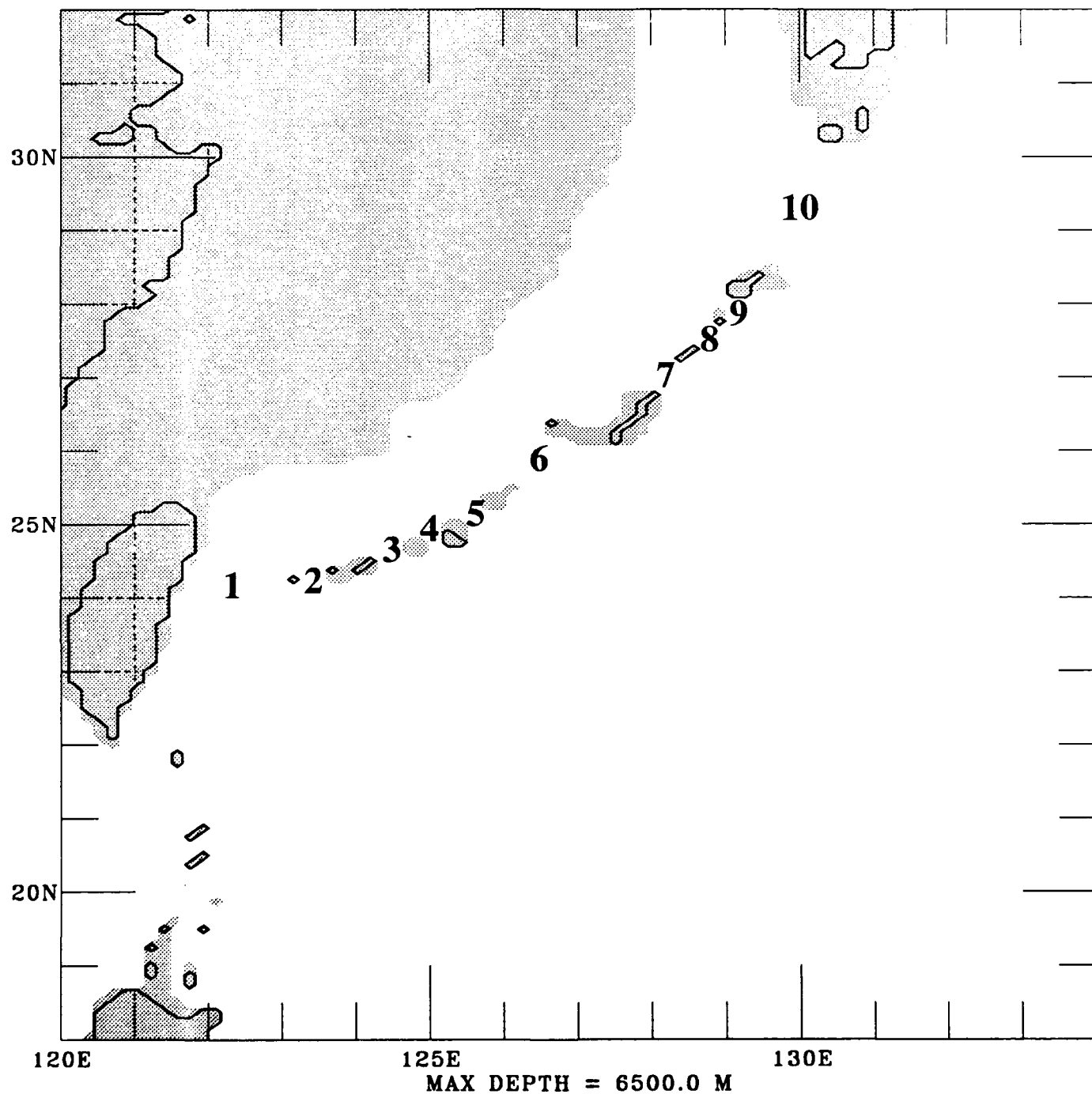


Figure 106: Plot of Southwest Pacific Ocean sill depth locations listed in table 1.

East China Sea

DX,DY = 0.176,0.125 DEG

DB = 0.0 M



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Figure 107: Plot of E China Sea sill depth locations listed in table 1.

Izu Ridge

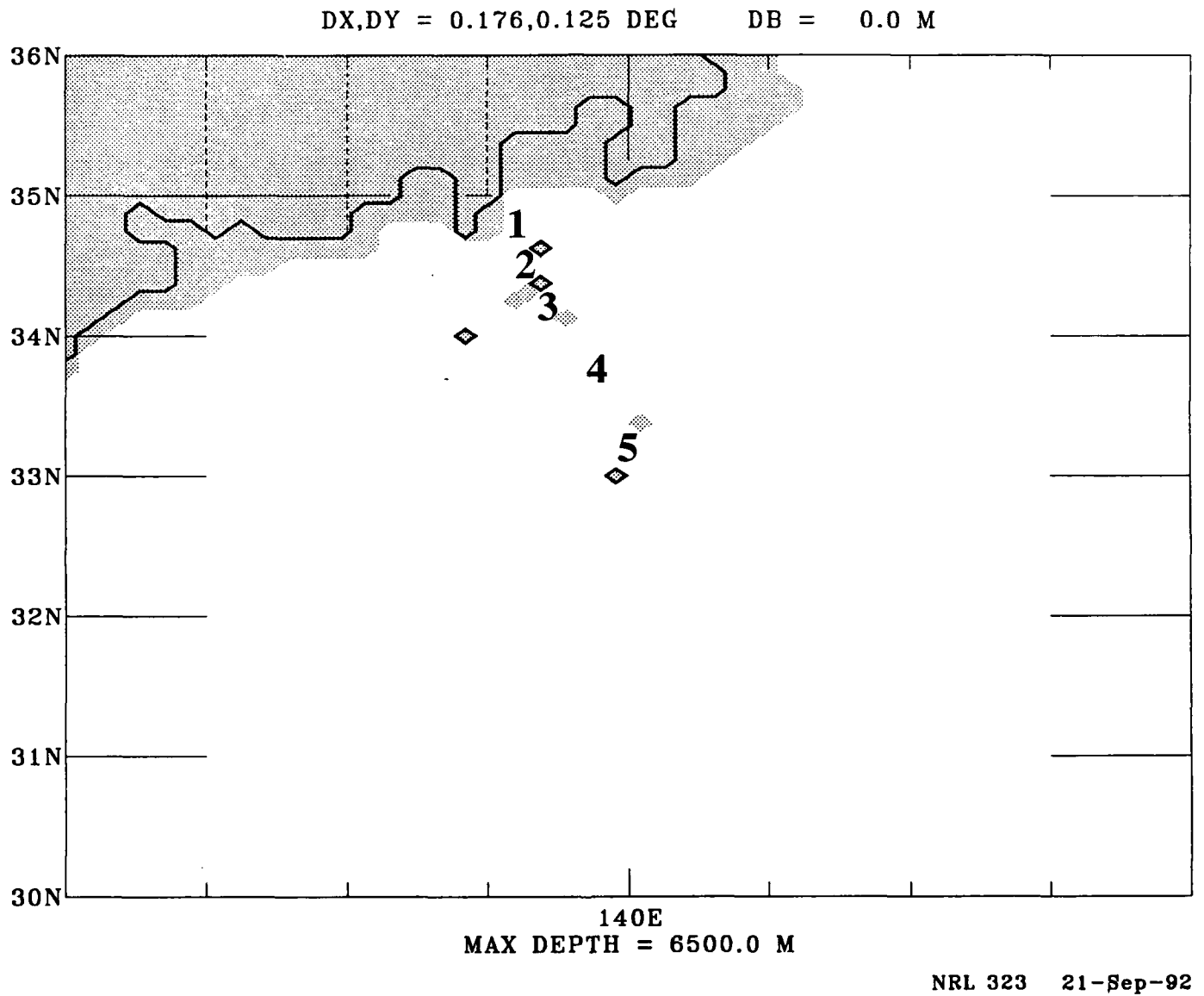


Figure 108: Plot of Izu Ridge sill depth locations listed in table 1.

Kuril Islands

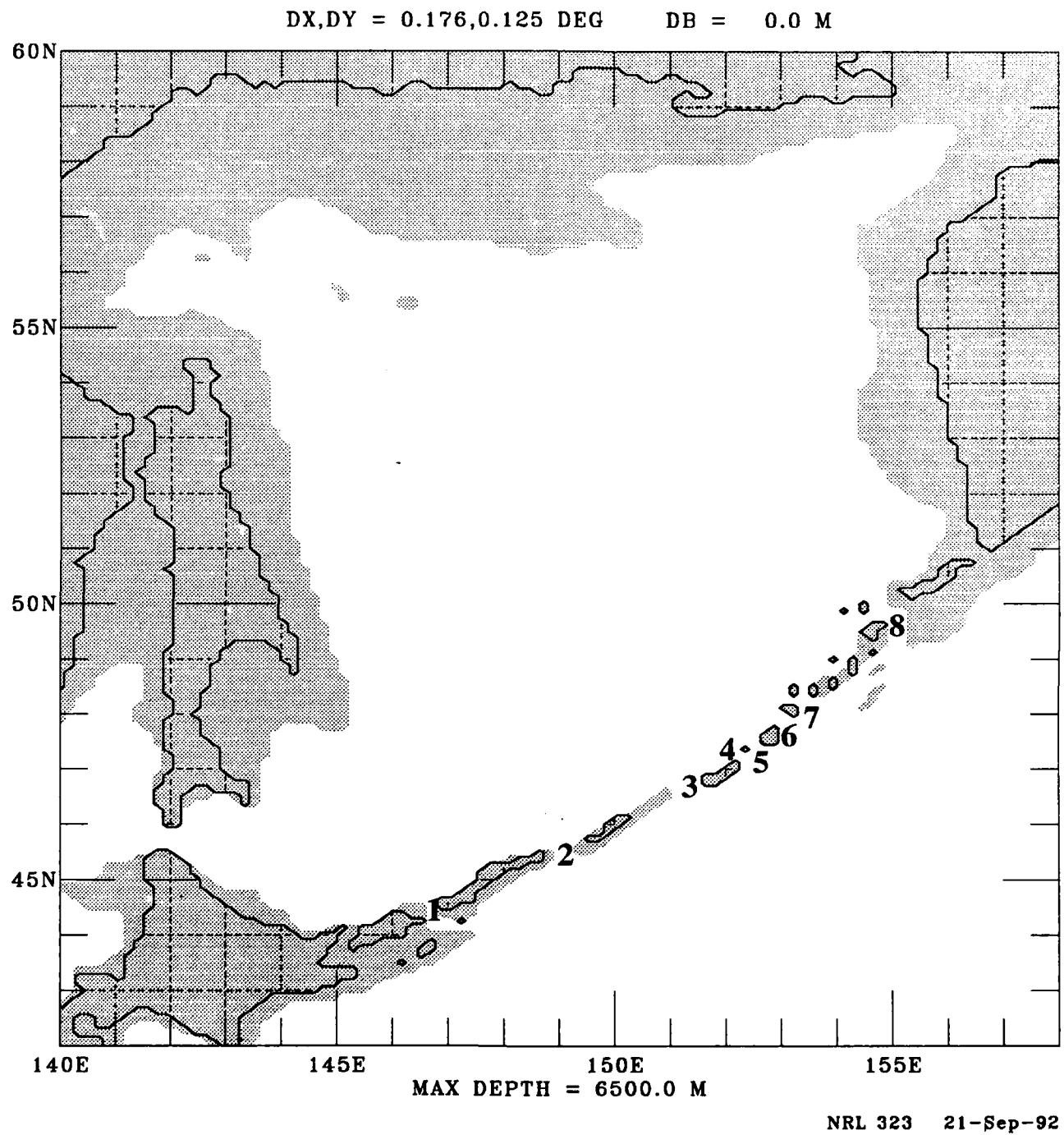
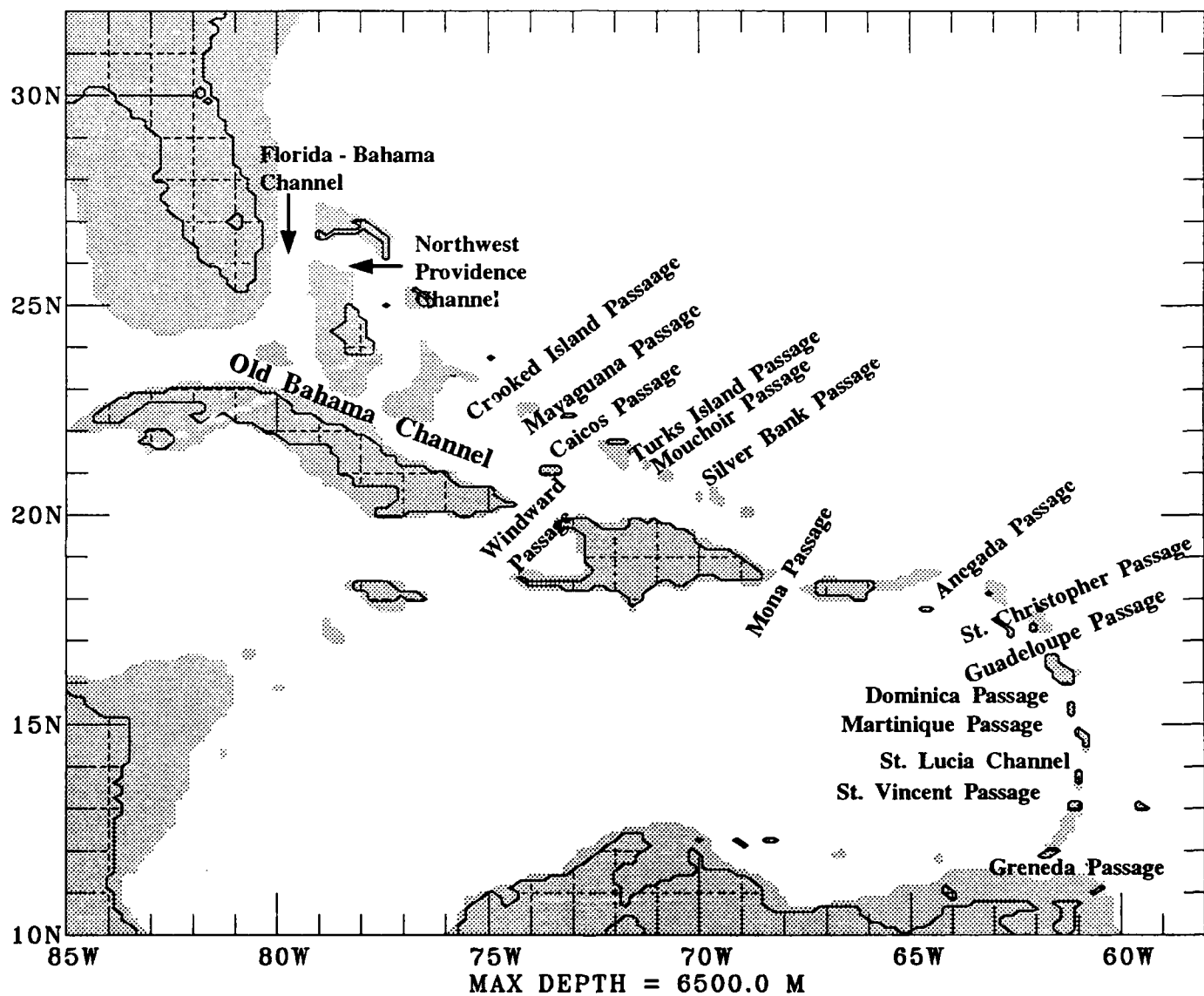


Figure 109: Plot of Kuril Island sill depth locations listed in table 1.

Caribbean Sea

DX,DY = 0.176,0.125 DEG

DB = 0.0 M

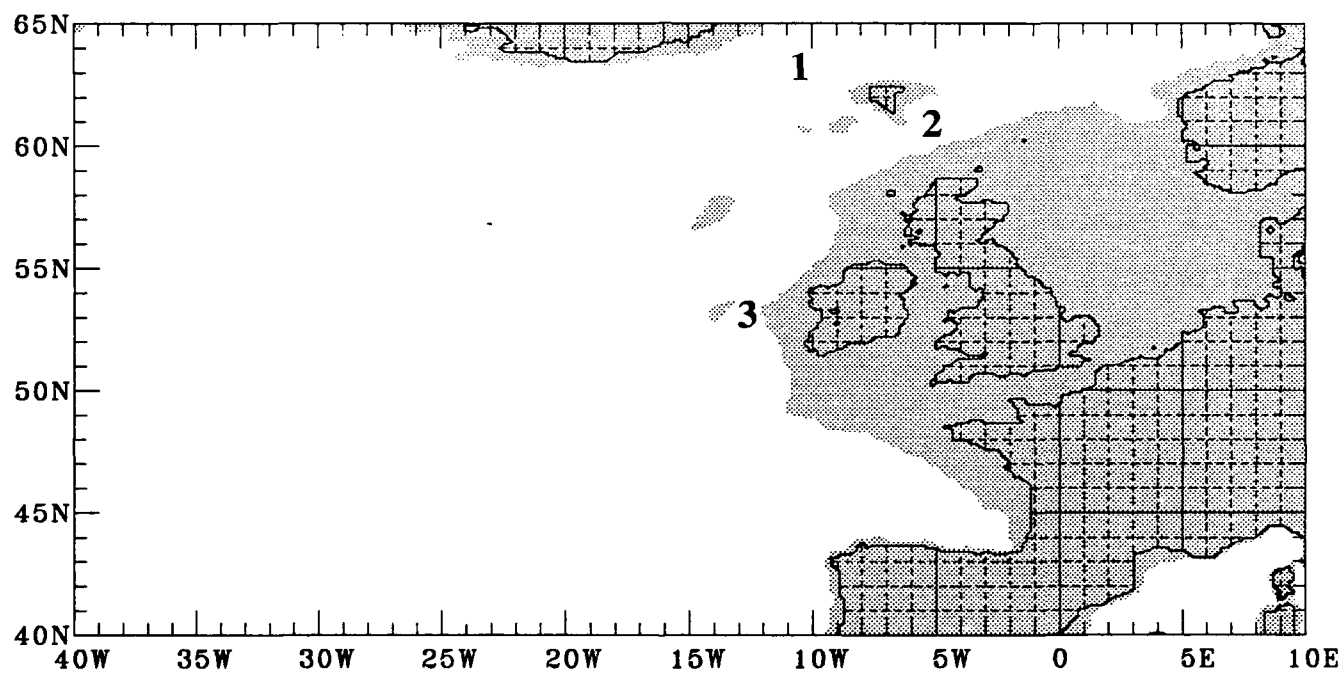


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Figure 110: Plot of Caribbean Sea and Leeward Island sill depth location listed in table 2.

GIN Sea

DX,DY = 0.176,0.125 DEG DB = 0.0 M



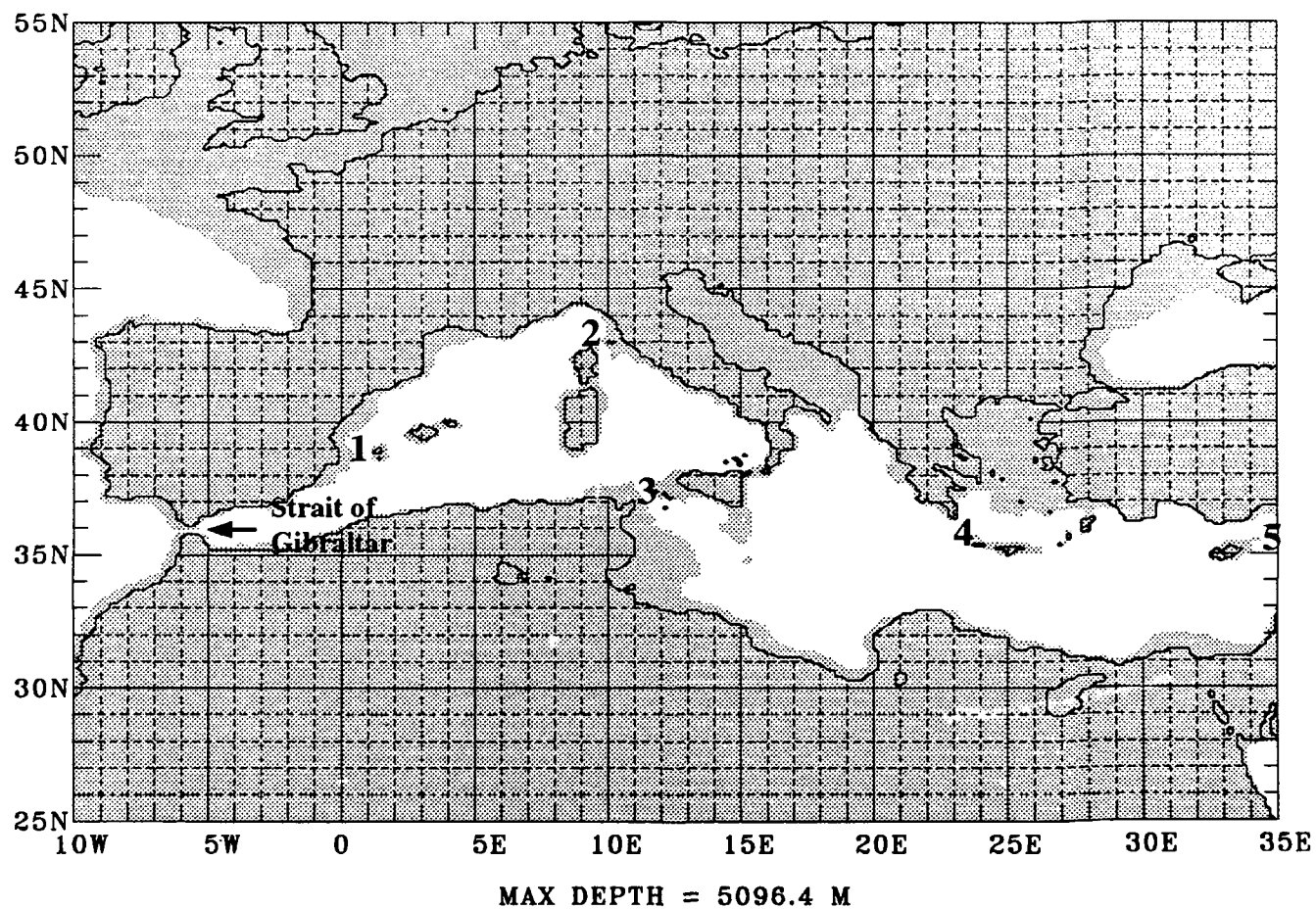
MAX DEPTH = 5464.5 M

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Figure 111: Plot of GIN Sea sill depth location listed in table 2.

Mediterranean Sea

DX,DY = 0.176,0.125 DEG DB = 0.0 M



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Figure 112: Plot of Mediterranean Sea sill depth locations listed in table 3.

New Zealand

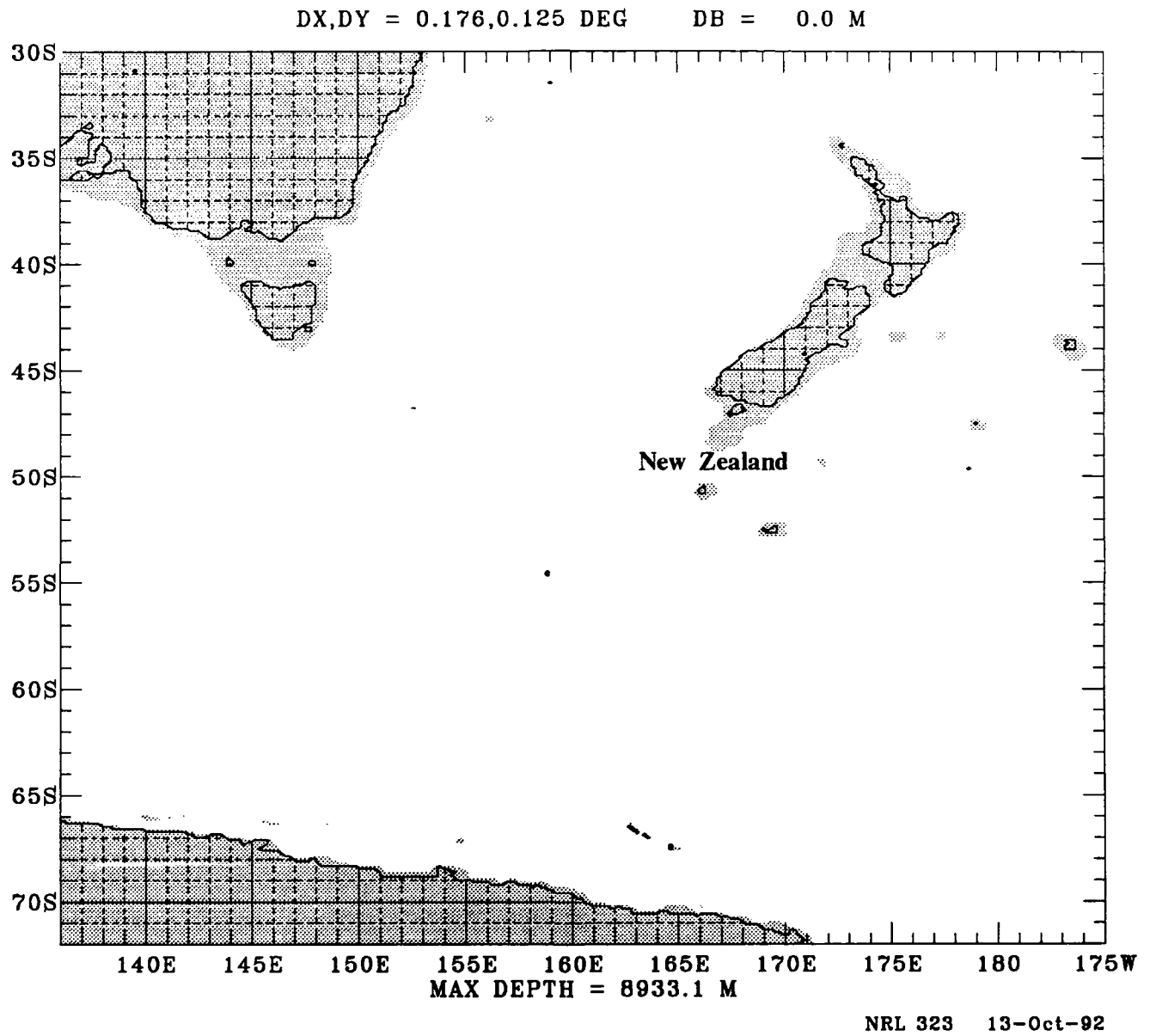
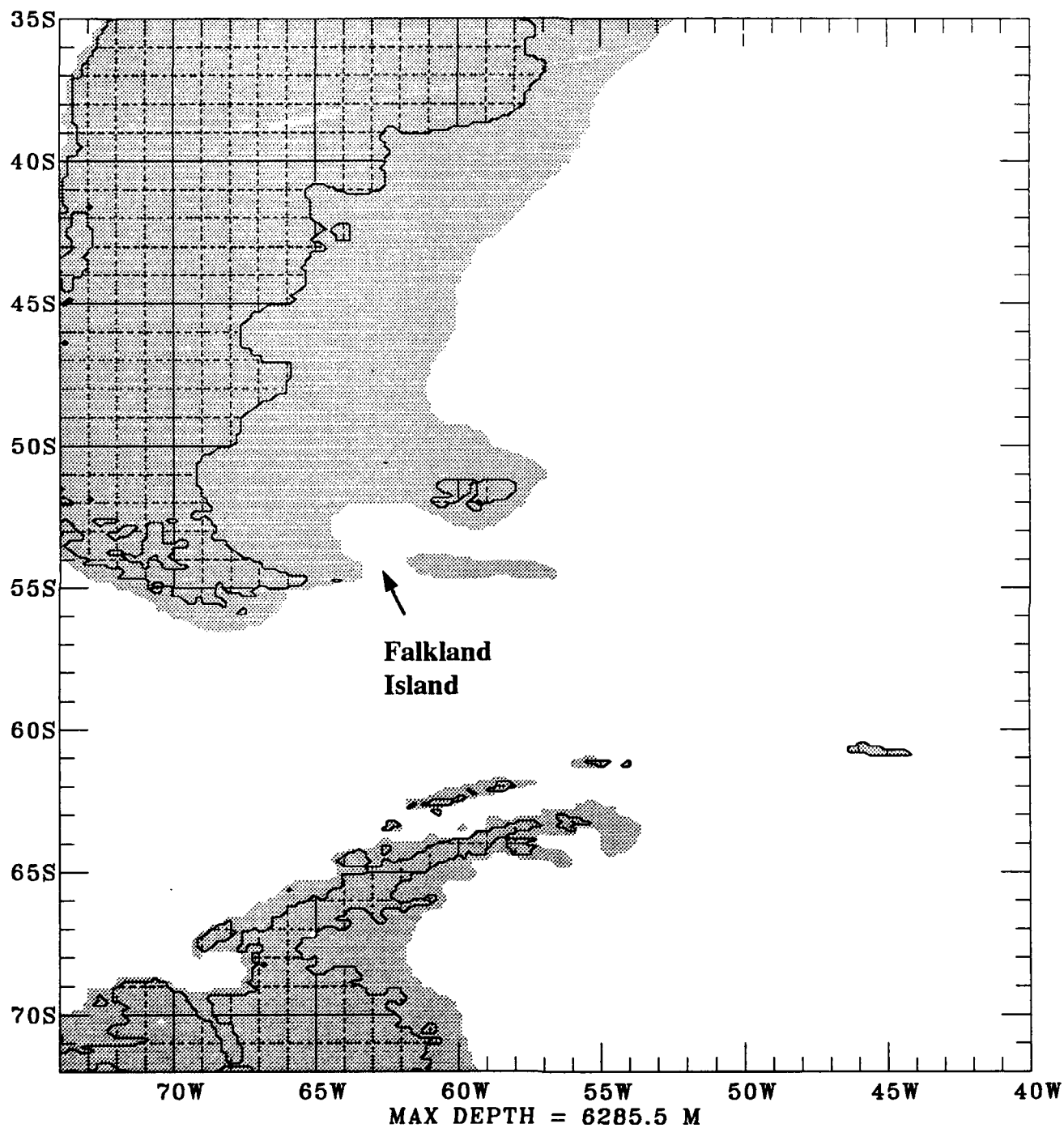


Figure 113: Plot of New Zealand sill depth location listed in table 3.

Falkland Islands

DX,DY = 0.176,0.125 DEG

DB = 0.0 M



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Figure 114: Plot of Falkland Island sill depth location listed in table 3.

Arabian Sea

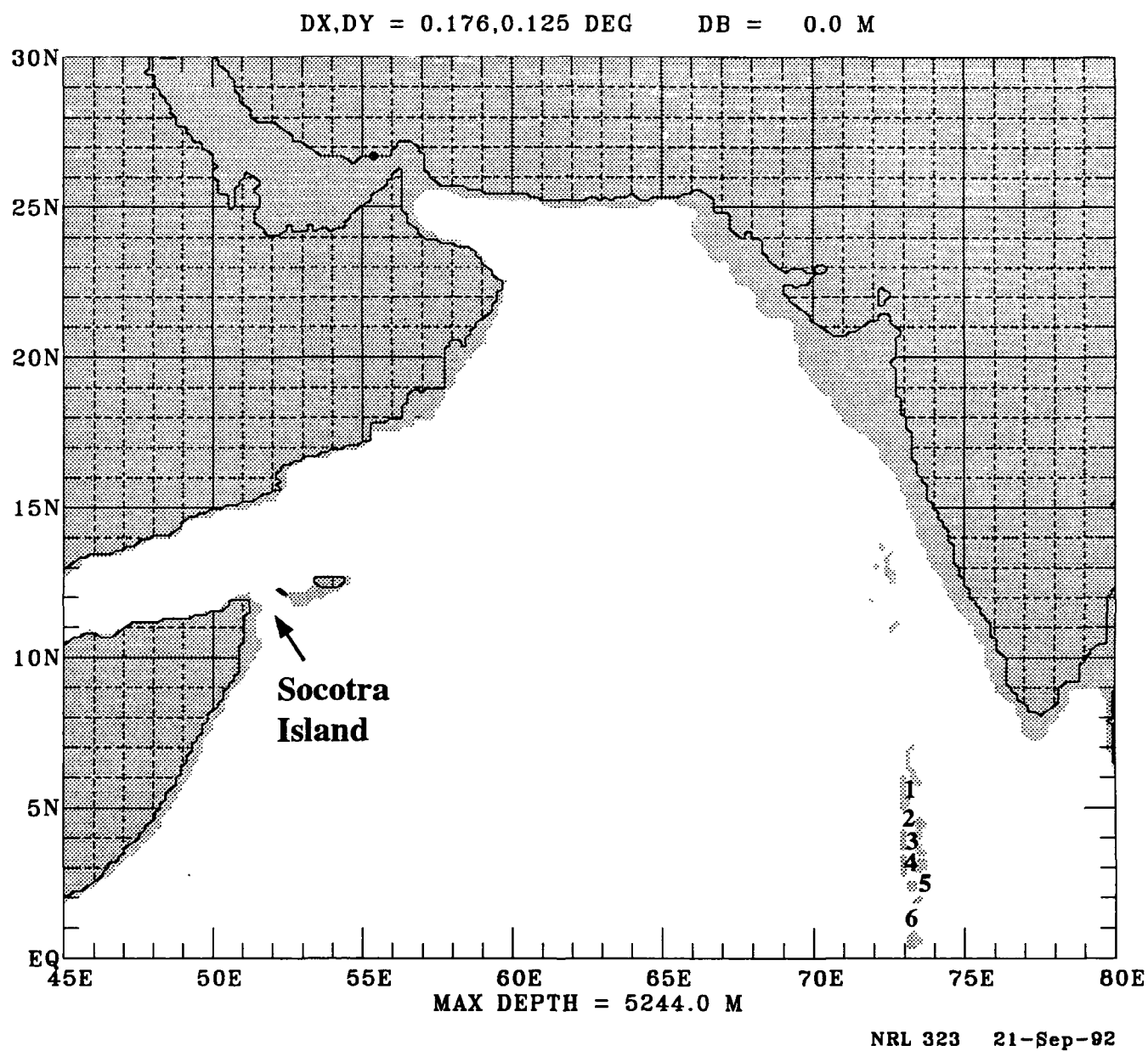
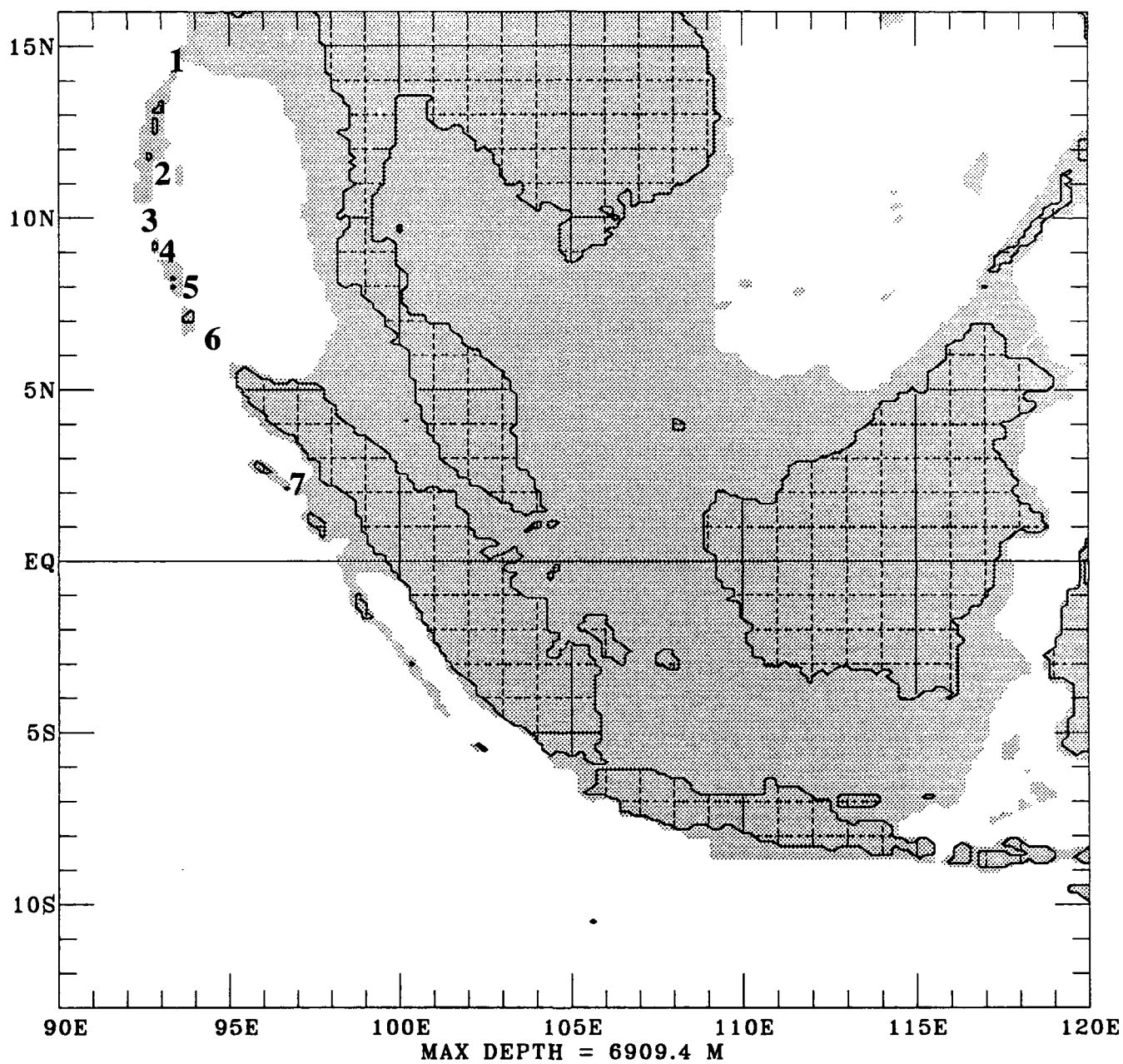


Figure 115: Plot of Arabian Sea sill depth location listed in table 4.

Andaman Sea

DX,DY = 0.176,0.125 DEG

DB = 0.0 M

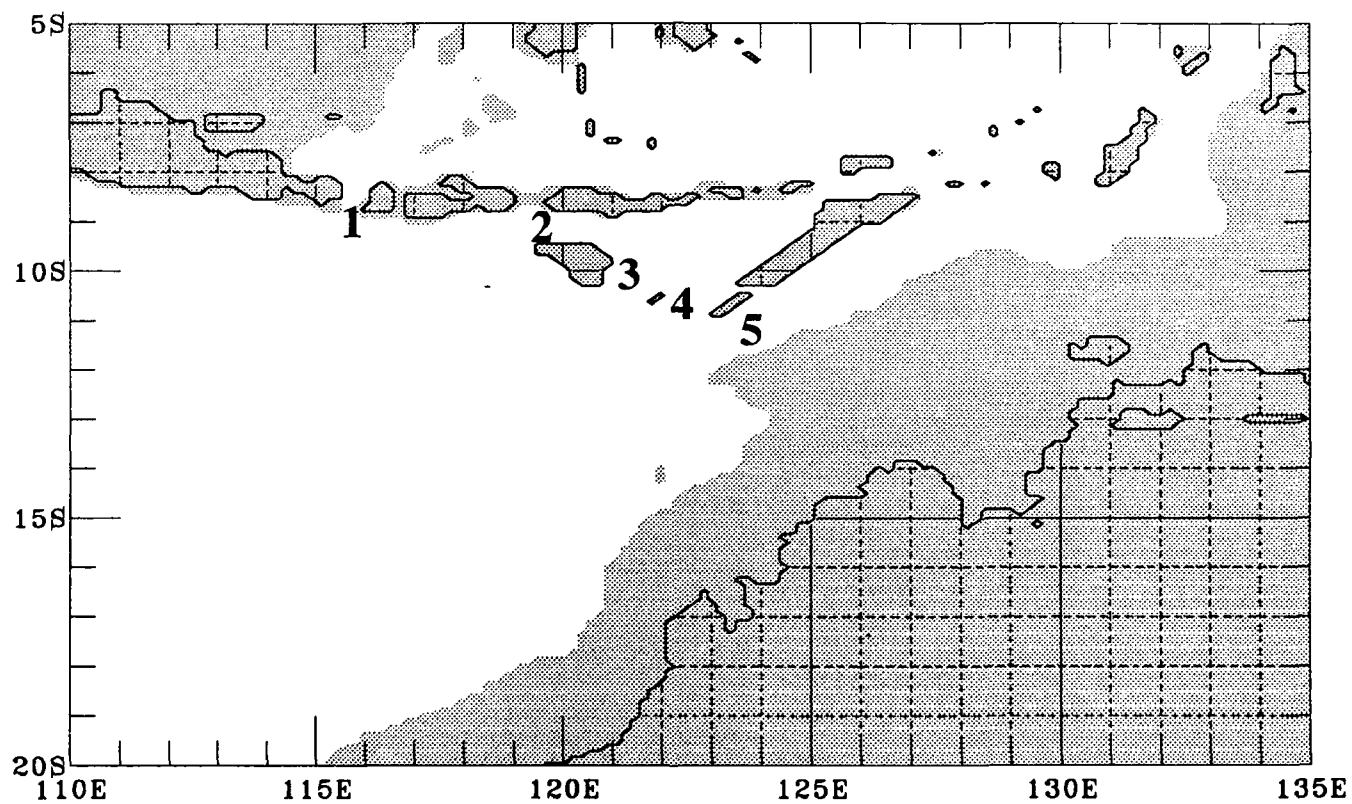


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Figure 116: Plot of Andaman Sea sill depth location listed in table 4.

Indonesian Throughflow Region

DX,DY = 0.176,0.125 DEG DB = 0.0 M



MAX DEPTH = 6837.8 M

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Figure 117: Plot of Indonesian Throughflow sill depth location listed in table 4.

Southwest Indian Ocean

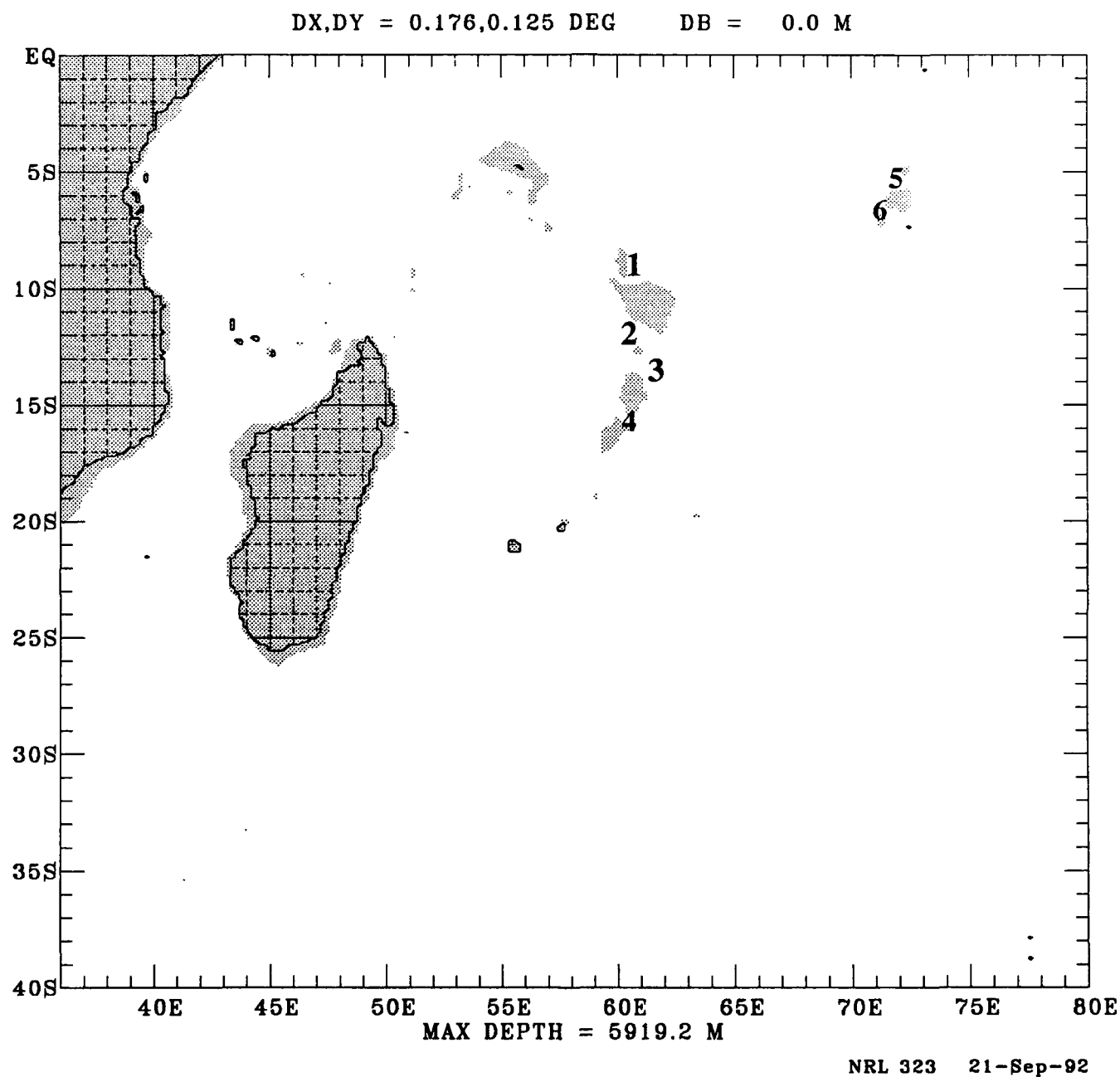


Figure 118: Plot of Southwest Indian Ocean sill depth location listed in table 4.